Alberta
Land Surveyors'
Association

MANUAL OF STANDARD PRACTICE

April 16, 2021

2021 Revisions

These revisions to the Manual of Standard Practice were approved at the online 2021 Annual General Meeting of the Alberta Land Surveyors' Association, and came into effect on April 16, 2021.

Part D: Standard Practice for Surveys and Plans

Section 8.8: Real Property Reports – Authentication:

- changed "original signature" to "ink or digital signature," page 69.
- deleted "The colour of both the permit stamp and the original signature are to be different from the colour of the printed document," page 69.

Part E: Appendices

Section 1: ALS Certifications – Alberta Land Surveyor's Real Property Report:

- Purpose of Report:
  - updated paragraphs 1, 3, and 4, pages 78-79.
- "This document is not valid…" sentence:
  - removed references to coloured ink, page 79.
  - added "or digital signature," page 79.

Section 3: Glossary:

- inserted definition of "digital signature," page 84.
- implemented resulting pagination changes, pages 84-86.

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PART A: INTRODUCTION

The Alberta Land Surveyors' Association (the Association, ALSA) is a self-governing profession established in accordance with the *Land Surveyors Act*. This legislation provides for the establishment and maintenance of standards for surveys conducted by Alberta Land Surveyors in keeping with the requirements of other regulatory authorities.

The purpose of the ALSA Manual of Standard Practice is to assist the Alberta Land Surveyor in practising the profession of land surveying with integrity and competence, and to ensure that surveys and plans of survey result in clear and unambiguous definitions of land boundaries.

Although the Alberta Land Surveyor should follow all standards identified in the Manual to the extent possible, the professional judgement of the Surveyor[1] may take precedence in situations where local conditions, conflicting requirements of other authorities, or other circumstances warrant defensible non-compliance with the Manual.

There is also an onus on the Alberta Land Surveyor to improve the Manual and to participate in keeping it current. A Surveyor who believes that it is appropriate to add, amend, or delete a standard has an obligation to bring recommendations for change to the ALSA membership.

[1] The Manual of Standard Practice uses the terms "Alberta Land Surveyor" and "Surveyor" interchangeably to refer to an Alberta Land Surveyor as defined by the *Land Surveyors Act*.

PART B: STANDARDS OF PRACTICE

Those who rely on an Alberta Land Surveyor may find it difficult to assess the quality of the Surveyor's services but they have a right to expect that a professional Surveyor will be a person of integrity and competence. The legislated Code of Ethics presented in Part B, Section 1 on pages 3 to 9 defines standards of conduct for the Alberta Land Surveyor and stresses the Surveyor's responsibility to the public and to clients, staff, and colleagues.

Ethical behaviour goes beyond "the letter" of the law to include "the spirit" intended by the Code of Ethics. Abstract components of ethical behaviour are not easily defined so using the Code of Ethics to judge an Alberta Land Surveyor must be undertaken carefully. For example, there may be situations in which it would be unreasonable to strictly enforce a particular part of the Code in a specific instance, and there may be situations in which a person is guilty of unethical conduct even though the Code does not specifically prohibit the behaviour in question.

It is the responsibility of the Association to determine whether or not the Code has been followed, both in letter and in spirit, examining the situation thoughtfully and reasonably, and applying the Code in a way that maintains the membership's commitment to serving the public lawfully, ethically, and responsibly.

Section 1: Code of Ethics

Under the *Land Surveyors Act*, Alberta Regulation 324/1982 legislates the Code of Ethics for Alberta Land Surveyors.

This Section presents the legislated Code of Ethics in bold print, followed by explanatory text.

The Code

1 An Alberta Land Surveyor shall serve society, clients, and the profession with the ultimate objective of contributing to the knowledge of land, to the better management of land, and to the preservation of peaceful and lawful enjoyment of land.

An Alberta Land Surveyor:

- has a public responsibility to serve society, clients, and the land surveying profession. This includes the establishment or re-establishment of land boundaries. The correct survey or resurvey of land boundaries is essential to the maintenance of Alberta's land survey and titles system, and an Alberta Land Surveyor must always maintain the province's cadastral fabric.
- has an obligation to safeguard the public interest, and this must always take precedence over any other interests. The Surveyor's duties must be carried out without favour, affection, or partiality.

Duty to Personnel

2 (1) An Alberta Land Surveyor has a duty to assist pupils and employees to achieve their optimum level of contribution to society through their contribution to the profession.

An Alberta Land Surveyor:

- shall assist students, trainees, and employees to obtain instruction in the practical, ethical, and theoretical aspects of surveying.
- has a particular obligation to ensure that students and trainees receive instruction in the art, practice, ethics, and profession of an Alberta Land Surveyor.

Professional Impropriety

(2) An Alberta Land Surveyor should avoid even the appearance of professional impropriety.

An Alberta Land Surveyor:

- shall disclose to the client any conflict of interest, affiliation, or prior involvement that could have even the appearance of preventing the Surveyor from carrying out professional duties with independence and objectivity. The Surveyor should accept or continue such employment only if the client consents.
- in doing work for multiple clients who could have conflicting interests, must explain fully to each client the implications of common representation and should accept or continue the work only if all the clients consent and the duties can be carried out with independence and objectivity. A conflicting interest could occur, for example, where the timing or completion of projects or approval of plans gives one client an advantage over another.
- must recommend that the client retain another Alberta Land Surveyor if any conflict of interest, affiliation, or prior involvement prevents the Surveyor from carrying out professional duties with independence and objectivity.
- shall not solicit work by offering payment or other inducement to secure such work. This prohibition includes compensation to a third party for a recommendation or referral.
- must attempt to resolve amicably any controversy with clients regarding fees. The Surveyor shall explain all charges incurred and make available to the client copies of any details relevant to the assessment. Where differences cannot be resolved, the Surveyor shall ensure that the client has knowledge of the complaint and mediation procedures available through the Alberta Land Surveyors' Association.
- shall not influence improperly any public body or official, and shall not state or imply that such influence is possible.
- shall guard the reputation of the land surveying profession in the same way that one guards one's own reputation, rebutting unjustified criticism of the profession, of other Surveyors, and of oneself.
- shall not allow one's name to be associated in a professional manner with any person or enterprise of a dubious nature.

Professional Confidences

(3) An Alberta Land Surveyor has a duty to preserve the confidences of clients and regard as privileged the information the Alberta Land Surveyor obtains regarding the affairs of clients.

An Alberta Land Surveyor:

- shall maintain confidentiality of the client's affairs during and after the provision of services or following the termination of a contract or agreement for the provision of services.
- is responsible for the compliance of students, trainees, and staff with this article, and must therefore exercise care in selecting and training employees.

This article does not apply to the normal release on request of boundary definition survey information to other Alberta Land Surveyors.

Professional Judgement

(4) An Alberta Land Surveyor has a duty to exercise unbiased independent professional judgement on behalf of clients and shall represent clients competently.

An Alberta Land Surveyor:

- must decline to accept direction from employers, directors, officers, or other superiors in the organization if such direction compromises the Surveyor's integrity, independence, or objectivity. A written agreement should be in place between the organization and the Surveyor to define the relationship, prevent misunderstandings, and allow the Surveyor independence of action and decisions.
- when forming a corporation, must ensure that any director, officer, or stockholder cannot influence the independence of any Alberta Land Surveyor employed by the corporation in carrying out professional duties.
- shall not accept assignments that are beyond the Surveyor's capability to complete in a reasonable time, that are beyond the Surveyor's level of competence, or that the Surveyor cannot carry out in a professional manner. This does not necessarily preclude accepting work in an area in which the Surveyor is not completely proficient, provided that the client is made fully aware of the limitation, the Surveyor does expect to become qualified, and the Surveyor's accepting the assignment will not result in an undue delay or expense to the client.

- if offered work for which the Surveyor is not qualified and does not expect to become qualified, should either decline the work or, with the consent of the client, accept the work in association with another Alberta Land Surveyor with the required expertise.
- shall present clearly to the client any circumstances in which the Surveyor's professional judgement may be overruled by a regulatory or legal authority, and the consequences for the client.

Integrity and Competence

(5) An Alberta Land Surveyor shall assist in maintaining and improving the integrity and competence of the profession of surveying.

This responsibility includes maintaining the survey system by cooperating with colleagues to resolve any apparent errors or discrepancies in a Surveyor's work and taking all necessary measures to remedy those errors or discrepancies.

An Alberta Land Surveyor:

- shall report to the Association any instance of incompetence or disregard for good practice. Allowing an inappropriate practice to continue could result in a deterioration of the survey system and harm the integrity of the profession. However, occasional errors or oversights can often be resolved between Surveyors and need not be reported to the Association unless the parties cannot agree to a solution.
- shall assume professional responsibility for all authorized work carried out by the Surveyor's non-professional staff.
- before accepting an applicant for articleship, shall ensure that the applicant has the necessary personal attributes required of an Alberta Land Surveyor, including good character.
- shall devote some time to the affairs of the Association, thereby contributing to the Association's constant effort to maintain and improve the survey system, procedures, institutions, and profession.
- shall participate in proposing and supporting legislation and programs to improve the survey system, procedures, institutions, and profession. If a Surveyor believes that the existence or non-existence of a rule of law, regulation, or instruction causes or contributes to an unjust result, that Surveyor should endeavour to obtain appropriate changes.
- shall participate in the activities of the Association, relevant professional development programs, and related professions or societies.

Dignity of the Profession

(6) An Alberta Land Surveyor has a duty to maintain the dignity of the profession in every association with clients, colleagues, and subordinates.

An Alberta Land Surveyor:

- shall limit advertising to the adequate provision of information to the public. Special care must be taken to ensure that information presented in advertising is relevant to the appropriate selection of a Surveyor. Preparation of advertisements and professional articles for lay publications and participation in seminars, lectures, and civic affairs should be motivated by a desire to educate the public and provide information relevant to the selection of the most appropriate Alberta Land Surveyor rather than to obtain publicity for particular Surveyors.
- shall refrain from making any false or misleading statements or using self-laudatory language in advertising.
- in dealing with a client or prospective client, shall not attempt to solicit assignments or projects that are being carried out by another Surveyor. If asked to participate in or complete a project being carried out by another Surveyor, an Alberta Land Surveyor shall do so only with the approval, withdrawal, or service termination of the previous Surveyor.
- shall not attempt to injure the professional reputation of any other Alberta Land Surveyor.
- shall refrain from public criticism of the conduct or practice of any other Alberta Land Surveyor.

Professional Services

(7) An Alberta Land Surveyor should assess and receive fair and just compensation, commensurate with the professional and technical complexity, level of responsibility, and liability potential of the services performed.

An Alberta Land Surveyor:

- shall assess a fee that will enable the Surveyor to serve the client effectively and complete the project using good survey practices. The Surveyor shall not charge more than a reasonable fee that could discourage potential clients from using professional land surveyors for the protection of their property rights and that could generally harm the reputation of Alberta Land Surveyors.
- shall arrive at a clear agreement with the client regarding fees to be charged for work, thereby preventing subsequent misunderstandings and contributing to good relations with the client.

- in estimates or quotations given to a prospective client, shall clearly outline the work covered by the estimate and any conditions that could contribute to additional costs. The Surveyor should not quote a fixed fee for an unknown quantity of work unless the fee includes all contingencies. Once the Surveyor has entered into an agreement to carry out survey work for a specified fee, the work shall be completed for the agreed amount.
- shall not reduce the quality of professional services to complete a project within the agreed cost.
- shall not divide a fee for surveying services with another Surveyor who is not a partner or associate of the Surveyor's firm unless:
  - the client agrees to the employment of an additional Surveyor after full disclosure of the division of fees;
  - the division of fees is proportional to the services performed; and
  - the total fee does not exceed reasonable compensation for all services provided to the client.
- shall not use the advantage of a salaried position to compete unfairly with another Alberta Land Surveyor.
- shall not engage in outside work without the knowledge and consent of the Surveyor's employer.

Unauthorized Practice

(8) An Alberta Land Surveyor shall assist in preventing the unauthorized practice of land surveying.

An Alberta Land Surveyor:

- shall report to the Association any instance of an unqualified person practising land surveying in Alberta. Limiting the practice of land surveying to professionals is intended to ensure that services are delivered to the public with competence and integrity.
- shall not enter into any arrangement that will enable an unqualified person or corporate body to complete a land survey directly or indirectly.
- shall not join or become a member of a company that carries out survey work unless an Alberta Land Surveyor will be taking responsibility for all land survey work performed by the company.

- shall not establish offices or branches unless these centres are under the fulltime direction and management of a resident Alberta Land Surveyor. This requirement guards against the real danger that non-professional personnel will assume—or appear to assume—professional duties, and that supervision will be inadequate. It is essential to retain and maintain the Surveyor-client relationship in the practice of land surveying.

This article does not preclude an Alberta Land Surveyor from delegating tasks to field and office assistants, clerks, and others while the Alberta Land Surveyor maintains a direct relationship with the client and supervises the work.

Section 2: Advertising Guidelines

2.1 Advertisements

Advertisements shall:

- be in good taste;
- be in the best interest of the public;
- be factual, and contain no false or inaccurate information;
- not be self-laudatory;
- not harm the dignity, integrity, and honour of the profession;
- not be misleading by containing a misrepresentation of fact or creating unrealistic expectations; and
- make no reference to price or fees for professional services.

2.2 Vehicle Signage

Alberta Land Surveyors shall place identification signage on all field vehicles used in the practice of surveying, with the company name to be at least five centimetres high. The signage may also include a logo, address, and telephone number, or any combination thereof. Signage of sub-contractors shall not be visible.

Section 3: Technical Services Sub-Contracting

An Alberta Land Surveyor:

- may engage the services of a person or persons not in the Surveyor's direct employ to perform technical functions on the Surveyor's behalf. The sub-contractor's technical functions are not to include or encompass client liaison or new business development.
- shall assume full responsibility for the actions and conduct of the sub-contractor during the term of the engagement as though the sub-contractor were in the Surveyor's direct employ. The Surveyor will issue all work instructions to the sub-contractor in person and receive the sub-contractor's completed work in person.
- shall not remunerate any of the Surveyor's technical assistants or the sub-contractor for services based on a proportion of the entire fee which the Surveyor charges a client for the whole service, nor a fixed fee that may encourage inferior methods or time-reducing procedures at cross-purposes with professional survey standards.

PART C: GENERAL STANDARDS AND PROCEDURES

Section 1: Measurements and Accuracies

This Section deals with measurements and accuracies associated with cadastral boundary definition surveys. As measurement techniques evolve and new methodologies become available, the Alberta Land Surveyor responsible for the plan shall comply with these guidelines and their intent.

The measure of accuracy for cadastral surveys shall be determined by using either the method of misclosure or the method of least squares.

1.1 Method of Misclosure

Where the method of misclosure is used, the measure of accuracy shall be expressed as a ratio between the length of the misclosure and the length of the surveyed line or lines. For example, a misclosure of 0.1 metres over a distance of 1,600 metres is expressed as 1**:**16,000.

1.2 Method of Least Squares

Where the method of least squares is used, the measure of accuracy shall include both the observational residuals and the semi-major axis of the 95% relative 2-dimensional (horizontal) and/or 1-dimensional (vertical) confidence regions between monuments in the survey.

The 95% confidence regions used to assess accuracy shall be derived from a properly weighted, minimally constrained adjustment of the network. The global variance factor computed by the adjustment must be tested with the Chi-Square Goodness-of-Fit Test. In the event that the variance factor does not pass this test, the reasons should be determined and the problem rectified. Subsequently, if the test still is not passed, the variance-covariance matrix must be scaled by the global variance factor.

The minimum accuracy standard, when expressed as a confidence region, shall be obtained using the formula **c = 0.02 + bd metres** where:

- **c** is the maximum allowable value of the semi-major axis of the 95% relative confidence region;
- **b** is the precision in parts per million (ppm); and
- **d** is the distance between monuments in metres.

1.3 New Surveys

The following minimum accuracy standards shall apply when closing on the Surveyor's own work in new surveys:

- When using the method of misclosure, the minimum accuracy standard shall be 1**:**7,500 or 0.02 metres.
- When using the method of least squares, both the observational residuals and the semi-major axis from the 2-dimensional relative confidence regions shall be determined as indicated in the formula in Part C, Section 1.2 (Method of Least Squares) on page 12, using a **b** value of 130 ppm.

1.4 Prior Surveys

The following minimum accuracy standards shall apply when closing on work performed by other Surveyors:

- When using the method of misclosure, the minimum accuracy standard shall be 1**:**5,000 or 0.02 metres.
- When using the method of least squares, both the observational residuals and the semi-major axis from the 2-dimensional relative confidence regions shall be determined as indicated in the formula in Part C, Section 1.2 (Method of Least Squares) on page 12, using a **b** value of 200 ppm.

1.5 Verifying Work

All surveys conducted under the *Surveys Act* must be verified by one or more of the following means:

- closure on prior or current work;
- closure on existing Alberta Survey Control;
- check-measuring all observations; or
- other appropriate means.

Sufficient field measurements shall be made to ensure there are no errors of layout or measurement.

1.6 Wellsite Surveys

1. These **vertical accuracy standards** apply to elevations (orthometric heights) published in wellsite survey plans:
    - Elevations shall be referred to any of the recommended vertical datums for spatially referenced data in Alberta as specified in Part D, Section 1.2 (Datum or Origin for Bearings and Coordinates) on pages 40 to 41. The reference vertical datum shall be indicated on the plan.
    - Elevations derived from a local benchmark are acceptable if the benchmark is accessible and clearly identified. The local benchmark and the published elevation shall be shown on the plan (i.e., Elevations were derived from ASCM 12345 Elev. = 999.99 metres, or Plant Site Control Pillar #6 Elev. = 888.88 metres).
    - Elevations shall be verified with sufficient redundant observations and by comparison with published values or checks to known control points.
    - The geoid model used to derive elevations using GNSS or remote sensing observations shall be indicated on the plan.
    - The relative vertical accuracy between any two points with elevations published shall be 0.3 metres or better at a 95% confidence level, independently of the distance between them and the method used.
    - The absolute vertical accuracy for elevations derived using Natural Resources Canada Precise Point Positioning Service (CSRS-PPP) shall be 0.3 metres or better at a 95% confidence level.

2. These **horizontal accuracy standards** apply when using the method of misclosure:
    - When closing on the Surveyor's own work in new surveys, the minimum accuracy standard shall be 1:7,500 or 0.02 metres.
    - When closing on work performed by other Surveyors, the minimum accuracy standard shall be 1:5,000 or 0.02 metres.

3. These **horizontal accuracy standards** apply when using GNSS methods:
    - The relative horizontal accuracy for monumented positions shall be 0.05 metres or better.
    - The absolute horizontal accuracy for monumented positions derived from Natural Resources Canada Precise Point Positioning Service (CSRS-PPP) shall be 0.1 metres or better at a 95% confidence level.

1.7 Lot Grading Certificates

These vertical accuracy standards apply within the Surveyor's own level circuits for each individual grading certificate survey, whether assuming an elevation, using published geodetic control monuments, or using the Surveyor's own established benchmarks:

- When using the method of misclosure, the misclosure shall not exceed 0.03 metres.
- Elevations shall be verified with sufficient redundant observations and by comparison with published values or checks to known control points.

Surveyors establishing geodetic benchmarks for their own control closer to their survey site(s) shall ensure the same accuracy standards above except that, using the method of misclosure, the misclosure in millimetres shall not exceed $50\sqrt{d}$ where d is the distance in kilometres.

Section 2: Measurements and Accuracies for GNSS Surveys

This Section provides guidelines for Global Navigation Satellite System (GNSS) measurements and associated computations performed for cadastral boundary definition surveys. GNSS includes GPS (American NavStar Global Positioning System), GLONASS (Russian Satellite Positioning System), and any future satellite positioning systems.

2.1 Sources of Error in GNSS Measurements

There are several possible sources of error in static and Real Time Kinematic (RTK) GNSS measurements, and these must be detected and mitigated during a GNSS survey to produce accurate and verifiable results. The primary sources of error are:

User error:	Typical user errors include data entry error and measurement blunders (e.g., incorrect antenna height).
Multi-path signals:	Multi-path signals are typical at locations where there is an obstructed sky view at the GNSS receiver. Satellite signals are reflected off the surfaces of nearby objects, resulting in an inaccurate determination of the position.
Satellite geometry:	An insufficient number of visible satellites or their positions relative to the user can result in a poor geometrical determination of the position.
Atmospheric delays:	Atmospheric conditions can cause disruptions and delays in the transmission of signals from the satellites to the receiver.
Incorrect initializations:	Initialization refers to the ambiguity resolution of the satellite signal carrier—the determination of the integer number of wavelengths between the GNSS receiver and the satellite, a process that is critical to achieving centimetre-level results from kinematic surveys. Other GNSS sources of error can cause an incorrect initialization or integer count, which results in a position error.

2.2 Accuracy Guidelines for GNSS Surveys

Because GNSS measurement and data reduction processes are complex, the following guidelines focus primarily on assessing the reliability and accuracy of these surveys. As GNSS technologies evolve and new methodologies become available, the Alberta Land Surveyor responsible for the plan shall comply with these guidelines and their intent.

1. GNSS surveys will be assessed as horizontal (2D) and/or vertical (1D) surveys for the purposes of accuracy measure.

2. Surveys conducted in whole or in part with GNSS techniques shall comply with the accuracy requirements in Part C, Section 1 (Measurements and Accuracies) on pages 12 to 15.

3. Static network adjustment shall include only (n-1) position differences (where n = number of GNSS receivers running simultaneously) or, if trivial position differences are included, the Surveyor should properly account for the mathematical correlations.

4. The position of every monument included in a GNSS survey, either found or placed, shall be verified with sufficient redundant observations or comparison with published information (e.g., registered plans, survey control).

5. Monuments observed by radial observations shall be checked using commonly accepted redundancy methods. Examples include:

    - radial ties from another known station;
    - independent measurements by conventional survey methods; and
    - point re-occupation with separate observation parameters and an independent initialization

6. The map projection for a survey shall be suitable and validated.

Section 3: Boundaries and Monumentation

The current version of the **statutory iron post** is a hollow iron post that is approximately 90 centimetres long and is pointed at the bottom. It has a solid top that is 10 centimetres long and 2 centimetres square, and is marked with a crown. There have been variations to the statutory iron post over the years but all have been constructed essentially as described here.

A **standard post** is a hollow metal pipe 2.0 centimetres in diameter and 76 centimetres in length. A brass cap (tablet) 7.5 centimetres in diameter is fastened to the top of the post, and a 7.5-centimetre square brass foot-plate is fastened to the bottom of the post. The cap is marked with a crown and the words *Province of Alberta*. Standard posts are currently available from the Director of Surveys.

Historically, the standard post used for Alberta Township Surveys has included the following variations in size and design over the years:

- The metal pipe varied between 2.0 and 3.5 centimetres in diameter, was approximately 76 centimetres in length, and was sometimes filled with concrete.
- A bronze or brass cap (tablet) 7.5 centimetres in diameter was fastened to the top.
- A malleable iron or brass foot-plate 7.5 to 9.0 centimetres in diameter (or square) was fastened to the bottom.
- The cap was marked with a crown and the words *Province of Alberta* or *Dominion Lands Surveys.*

The 9th and 10th Editions of the *Manual of Instructions for the Survey of Dominion Lands* contain diagrams and written descriptions of a common version of this monument.

3.1 Recommended Monuments

1. Under the *Surveys Act*, statutory iron posts are required at all property corners.

2. Statutory iron posts must be used for all surveys carried out under the *Surveys Act* except when the Director of Surveys stipulates otherwise for surveys carried out under Part 2 of the Act—see Part C, Section 3.2 (Monuments) on page 19.

3. Where it is not practical to place a statutory iron post, one of the following should be used:
    - lead plug "with tack" in drill hole for rock or concrete conditions;
    - concrete nail "with washer" for asphalt conditions; or
    - round, 2-centimetre diameter, solid steel bar for gravel conditions, of a length to suit the circumstances.

4. Other monuments may be used at the Surveyor's discretion if one of the above is impractical.

5. Reference monuments may be used at an offset location if the actual corner is not accessible or if it is impractical to monument, but the reference monument must not create confusion or ambiguity.

3.2 Monuments

For surveys under Part 2 of the *Surveys Act*, standard posts are to be used unless the Director of Surveys approves the use of a different monument.

3.3 Marker Posts and Bearing Trees

Where practical, monuments shall be referenced by a marker post placed 0.3 metres from the monument, and the direction shall be noted on the plan.

1. Marker posts should not be placed where they may constitute a hazard to the public or interfere with the normal use of land. In general, marker posts should not be placed in developed urban areas.

2. Marker posts placed along road or right-of-way surveys should be situated on adjacent fence lines whenever possible.

3. For surveys in Unsurveyed Territory, bearing trees and/or marker posts are required.

4. Where a marker post is placed other than 0.3 metres from a monument, both the distance and the direction of the marker post from the monument shall be noted on the plan.

5. Marker posts must be of a design approved by the Alberta Land Surveyors' Association.

3.4 Intersections

When surveying boundaries that intersect surveyed section or quarter sections lines, the intersections shall be made using the nearest section or quarter section corners on each side of the point of intersection. If the monuments at these corners are lost, the lost corners and all section and quarter section corners between the survey evidence used to re-establish the lost corners shall be re-established and monumented, giving due consideration to all available evidence.

When surveying public land dispositions that require monumentation to be statutory iron posts, intersections must be made with existing public land disposition boundaries that are defined by statutory iron posts and crossed by the new disposition. The intersection shall be made by using the nearest governing monuments on either side of the point of intersection. If the monuments at these positions are lost, the lost monuments and all monuments used to re-establish the lost monuments shall be re-established and monumented, giving due consideration to all available evidence.

3.5 Frequency of Monumentation

In addition to monumenting intersections with existing survey lines, Part 3 of the *Surveys Act* requires (with some exceptions) that all new boundaries be monumented at every deflection and point of curvature. For further details, refer to the sections in the Manual of Standard Practice that deal with specific types of surveys.

3.6 Countersinking Monuments

Monuments shall be countersunk in areas where they interfere with farming or grading operations, and noted on the plan. When practical, it is good practice to reference and raise to ground level any monuments found buried in urban residential areas.

3.7 Boundary Types

All surveyed boundaries other than natural boundaries must be either straight lines or circular curve segments.

3.8 Permit Number

Statutory iron posts placed shall be legibly and permanently marked with the survey corporation or partnership permit number, or with the registration number of the individual Surveyor not affiliated with a survey corporation or partnership. The markings placed on the iron post shall be noted in the legend on the plan.

3.9 Establishment of Monuments Plan

1. If a statutory monument has been established but is not shown on a plan containing a Surveyor's affidavit or statutory declaration in the prescribed form and registered at the Land Titles Office, Alberta Environment and Parks, or the Métis Settlements Land Registry, the Surveyor must register an Establishment of Monuments Plan at the Land Titles Office or the Métis Settlements Land Registry within two years of establishing the monument. Before registering an Establishment of Monuments Plan, the Surveyor shall make every effort to receive the client's consent to the registration. This includes, but is not limited to, educating the client regarding the importance of registering the plan by providing appropriate notification letters and follow-up correspondence. The Surveyor's corporation or partnership is responsible for registering the Plan of Survey or Establishment of Monuments Plan if the Surveyor who conducted the survey is no longer employed by the corporation or partnership.

2. These requirements do not negate the requirements of Sections 44 and 46 of the *Surveys Act* regarding the re-establishment of survey monuments established under Part 2 or Part 3 of the Act. If the statutory monument is a restoration, refer to Part C, Section 5.10 (Restoration of Monuments) on page 30.

3. If the client's consent cannot be obtained and the facility has been constructed, an Establishment of Monuments Plan depicting both the location of monuments and the unregistered right-of-way can be registered at the Land Titles Office or the Métis Settlements Land Registry. The unregistered right-of-way boundaries must be shown as dashed lines, and areas are not to be shown. The label shall include the word "Unregistered," along with the width and purpose of the right-of-way and the name of the practitioner responsible for the survey. The monuments placed do not have governing status for the location of the unregistered right-of-way.

3.10 Wellsites and Related Facilities

The type of monumentation found or placed for wellsites and related facilities shall be shown on the plan. The placement of 30-centimetre iron spikes or iron bars of at least 30 centimetres is recommended.

3.11 Iron Post Markings

If a statutory iron post is placed to re-establish a lost monument or to restore an obliterated monument originally placed at a section or quarter section corner, the iron post shall be marked with the same designation as the original monument and the numbers shall be applied legibly and permanently.

Corner	Markings
Section Corner	Section, Township, Range
Quarter Section	One Quarter (1/4)
Centre of Section	One Quarter (1/4)

3.12 Alberta Survey Control Marker Condition Reports

For every Alberta Survey Control Marker (ASCM) destroyed, found disturbed, not found, or incorrectly described on the ASCM ID card, the Surveyor shall prepare, certify, and submit to the Director of Surveys an ASCM Condition Report on a form provided by the Director of Surveys.

If the ASCM ID card has not been updated in at least two years, it is recommended that the Surveyor prepare, certify, and submit to the Director of Surveys an ASCM Condition Report on a form provided by the Director of Surveys.

Section 4: Natural Boundaries

4.1 Common Law

In common law, a natural boundary at any instant is the designated natural feature as it exists at that instant, and the boundary position changes with the natural movements of the feature as long as these movements are gradual and imperceptible from moment to moment.

It is essential to designate clearly and concisely, both in the field notes and on the plan, the character of any natural feature adopted as a boundary. In the case of water boundaries, except where applicable legislation, judicial decision, or existing rights are to the contrary, the bank shall be used as the feature defining the boundary.

A Surveyor may determine a natural boundary using any method that accurately determines the location of that boundary at the time of survey.

In accordance with Section 17 of the *Surveys Act*, when surveying a natural boundary that is a body of water, the Surveyor shall determine the position of the line where the bed and shore of the body of water ceases, and that line shall be referred to as the bank of the body of water.

The "right" or "left" bank of a stream is the bank that is on the right or left side of the bed and shore when the observer is looking downstream. The "bed and shore" of a body of water is the land covered so long by water as to wrest it from vegetation or as to mark a distinct aquatic character on the vegetation or the soil itself where it extends into the water.

4.2 Riparian Rights

1. When it has been confirmed that an adjoining owner has riparian rights, the bank of the body of water shall be shown as it exists at the time of survey.

2. If it is found that an owner does not have riparian rights, the bank shall be shown according to the traverse of the river or lake on which the title is based. Field notes of these traverses are available from the Alberta Land Titles Spatial Information System (SPIN), the Provincial Archives, and the Director of Surveys Office.

3. If it is necessary to show the present bank and its position at the time of patent, both traverses shall be shown. The current title boundary shall be shown in a solid black line and the other in a broken black line. A notation of the date of traverse and the name of the Surveyor shall be shown on each.

4.3 Locating Natural Boundaries

1. The position of natural boundaries can be determined by any method, provided that the boundary is plotted at the final plan scale to an accuracy of 0.5 mm. This table shows the required positional accuracy for the captured natural boundary to achieve the required plan accuracy of 0.5 mm at various plan scales:

Plan Scale	Positional Accuracy
1:30,000	15.0 metres
1:20,000	10.0 metres
1:10,000	5.0 metres
1:5,000	2.5 metres
1:2,000	1.0 metres
1:1,000	0.5 metres

2. If natural boundaries are located using a ground survey network, the distance between bank identification points will not exceed 30-metre intervals.

3. If the natural boundary is plotted from aerial photographs, maps, digital imagery, or another information source that the Surveyor has not prepared, the Surveyor shall inspect the boundary on the ground to verify by appropriate means, including making sufficient measurements, that the plotting accuracy of 0.5 mm at the final plan scale will be achieved.

4. The plan showing the natural boundary shall clearly state the method used to determine its position. It shall also identify the aerial imagery or other remotely sensed data used, the method of data capture, and the date of data capture, and show all ground verification survey data. It may also be appropriate to show UTM or 3TM coordinates for ground verification positions.

5. The aerial photographs, maps, digital imagery, and other information used will be retained by the Surveyor as part of the field notes.

6. The information contained in Section 4.3 (Locating Natural Boundaries) on pages 24 to 25 does not apply to Descriptive Plans, which are addressed by Part D, Section 7.2 (Descriptive Plans – Natural Boundaries) on page 64.

4.4 Changes in Natural Boundaries

Registration of a plan containing a change in a natural boundary requires consent from Alberta Environment and Parks.

Plan submission requirements are outlined in the Director of Surveys' document entitled *Updated Plan Submission Requirements for Changes in Natural Boundaries*.

Section 5: Retracement, Restoration, and Re-Establishment

The guidelines in this Section must be considered in the context of fundamental survey law. They are not "prescriptive" but rather are intended to assist the Alberta Land Surveyor in making a "best evidence" determination.

Monuments placed and intended to govern boundaries pursuant to the *Surveys Act* shall govern those boundaries if they are found to be in their original position. The principle of using the "best evidence" of the original position of the monument shall guide the Surveyor in retracing boundaries and restoring obliterated monuments or re-establishing lost monuments.

5.1 Research

Prior to undertaking a retracement survey, a thorough review of all available information pertaining to the property boundary is mandatory. Relevant information includes, but is not limited to:

1. Land Titles Office registered plans, Certificates of Title, and other documents.
2. Director of Surveys Office original Township Plans, original field notes for the Township Surveys, and cadastral tie reports. Township Plans and original field notes are also available from the Alberta Land Titles Spatial Information System (SPIN) and the Provincial Archives.
3. Other Surveyors' files and field notes when they are known to exist but the survey has not been publicly recorded.
4. Alberta Energy Regulator wellsite plans and licensed pipelines.
5. *Bulletin 38 (Department of the Interior), giving a Description of Boundary Monuments Erected on Surveys of Dominion Lands 1871-1917.*
6. Various editions of *Manual of Instructions for the Surveys of Dominion Lands*.
7. Registered public land disposition plans.
8. Métis Settlements Land Registry registered plans and other documents.

5.2 Hierarchy of Evidence

When an Alberta Land Surveyor is contracted to retrace original or existing surveyed property boundaries, the Surveyor must make a thorough field investigation to unearth evidence regarding the position of the boundaries as originally surveyed.

The hierarchy of evidence regarding boundaries is as follows:

1. Natural boundaries or evidence of natural boundaries.
2. Original monuments or traces of original monuments.
3. Fences or evidence of possession reasonably dating back to the original survey.
4. Measurements as shown on previous plans of survey.

5.3 Verbal Evidence

Section 13 of the *Surveys Act* empowers Alberta Land Surveyors to examine witnesses under oath in relation to determining the true and original position of survey monuments that have been destroyed. Appropriate testimony from a reliable witness who has first-hand knowledge may be the best evidence available in retracement surveys. The evidence should be transcribed in writing and signed under oath by the witness.

5.4 Coordinates

Coordinates on property corners and ties to Alberta Survey Control Markers may be useful evidence of original monument locations and are deemed to be measurements in the hierarchy of evidence.

5.5 Conflicting Evidence

Positional conflicts arising from plan dimensions, monuments on the ground, or other sources are not uncommon in conducting retracement surveys. It is the responsibility of the Alberta Land Surveyor to resolve such conflicts objectively by considering the following:

1. Property lines established on a registered Subdivision Plan or original Township Plan cannot be altered by subsequent plans, although re-subdivision can be used to effect new boundaries between consenting owners.

2. Given ambiguity or conflict within a single plan, the "intent" of the original survey should guide the Surveyor in effecting re-establishment.

3. The advice of the Director of Surveys, experienced Surveyors, or the original Surveyor should be sought in difficult cases.

4. If a boundary conflict cannot be resolved by the Surveyor, the Surveyor should consider referring the matter to the ALSA Boundary Panel before resorting to the Provincial Court or the Court of Queen's Bench. The Surveyor may be treated as an expert witness by each of these bodies.

5.6 Witness Monuments

When establishing a section or quarter section corner from a witness monument placed subsequent to 1890, that corner shall be defined by producing the line through the witness monument from the nearest section or quarter section corner on the same side of the witnessed corner. The corner in question shall be placed at the distance indicated for the witness monument.

Prior to 1890, the placement of witness monuments on a surveyed line was not required so corner establishment for monuments placed before that date should be based on the nature of the evidence.

5.7 Original Field Notes

When searching for original section or quarter section corner monuments, the original field notes for the Township Survey may be indispensable. Information such as direction of survey and ties to topographic features may assist in a thorough search for evidence. Copies of the original field notes for Township Surveys are available from the Alberta Land Titles Spatial Information System (SPIN), the Provincial Archives, and the Director of Surveys Office.

5.8 Lost Monuments on Subdivision Surveys

On or before February 16, 1912, it was mandatory to monument all lot and block corners on subdivision surveys. After February 16, 1912 and before June 9, 1988, posting was required only for block outlines, deflections, and those lot corners falling on a curvilinear block boundary. On June 9, 1988 the *Surveys Act* was amended, again making monumentation mandatory at all lot and block corners.

It is therefore essential to search for original monuments at all corners when retracing lot boundaries originally created on or before February 16, 1912 and on or after June 9, 1988. When establishing or re-establishing a lot corner from a plan registered at the Land Titles Office after February 16, 1912 and before June 9, 1988, the positions of the property lines are governed by the plan dimensions in relation to the block corners and monuments on curvilinear boundaries. Proportioning from the original block corner monuments or from the re-established positions of these monuments is generally required.

In the following interpretation, a parcel is an area of land within a subdivision plan for which one Certificate of Title was issued. For the purpose of interpreting Section 45(5) of the *Surveys Act*, a "block" is a group of one or more parcels and any adjoining lanes within a subdivision plan that fits one of the following definitions:

- all those parcels that have the same block number shown on the subdivision plan;
- a single parcel or contiguous parcels designated only as lots; or
- a single parcel designated as a unique "block," "parcel," "area," or anything else other than "lot."

5.9 Lost Monuments on Township Surveys

When monuments on original Township Survey boundaries cannot be restored from traces of the original monument remaining on the ground, from other physical evidence, or from testimony by witnesses, the Surveyor may proceed to re-establish the monument as a last resort by measurement from other monuments that are connected to it by survey.

If the re-establishment uses other monuments from the original Township Survey, the Surveyor shall consider the intent and sequence of the original survey.

If the lost monument is in the interior of the township, generally other monuments north and south of the lost corner should be used. If it is on the exterior boundary of the township, other monuments on either side of the lost corner on the same township boundary should be used.

In re-establishing lost quarter corners on east-west section boundaries in the interior of the township, the Surveyor should consider the relationship of the lost quarter section corner to section corners on either side.

When re-establishing a lost monument, the Surveyor is responsible for assessing all available evidence, including other monuments placed on subsequent plans. The re-establishment should be performed using the best evidence available, and additional ties should be made to other monuments to validate the re-establishment.

When re-establishing lost corners in original Township Surveys, the Surveyor shall give due consideration to the bearings as shown on the official or registered plan.

5.10 Restoration of Monuments

All damaged or obliterated monuments used in a survey, whether urban or rural, should be restored. However, pits, mounds, and trenches on original Township Surveys shall not be reconstructed or restored unless the Surveyor is instructed to do so by the Director of Surveys.

All restored monuments for which a new statutory monument has been placed must be recorded in the Corner Recordation Index or registered on a plan of survey at the Land Titles Office, Alberta Environment and Parks, or the Métis Settlements Land Registry.

5.11 Re-Establishment of Curves

Section 45(1)(a)(i) and Section 45(2) of the *Surveys Act* should be followed to define curvilinear property boundaries. The radius shown on the original plan of survey and the position of original monuments shall be held. The chord or radial bearing should be shown on the plan.

Section 6: Field Notes

The following requirements pertain to compiling, recording, and retaining field notes and survey returns that are made in conjunction with all surveys.

6.1 Systematic Records

1. Systematic records shall be made of all field measurements at the time of observation and shall be identified as field notes.

2. The field notes shall be preserved permanently and filed such that ready retrieval is possible.

6.2 Content of Field Notes

The field notes shall give a clear and detailed account of everything found, observed, and done during the course of the survey, including:

1. Date of observations, location, and purpose of the survey.
2. Type and identification of equipment.
3. Environmental conditions, including meteorological readings.
4. Name of the person(s) making and recording the observations.
5. Complete description of the condition of every monument found, restored, and placed, and of every permanent structure referencing that monument.
6. Record of all physical, documentary, and/or verbal searches made for evidence, and identification of all lost monuments.
7. Diagram representing the survey.

6.3 No Changes to Field Notes

Entries in field notes shall not be erased, altered, or obliterated.

6.4 Remote Positioning Data

For surveys done partially or completely using remote positioning or satellite positioning techniques, the field records shall also include:

1. Observation procedures, raw data, and logistics.
2. Reduction procedures of the observed data, including software versions.
3. Processed remote positioning data from which cadastral survey measurements are derived.

Section 7: Integrated Surveys

7.1 Requirements

1. Every survey for which a plan is to be registered under the *Land Titles Act* or the *Métis Settlements Land Registry Regulation* requires integration with survey control if two or more monuments found or placed by the survey are each within one kilometre of any two Alberta Survey Control Markers (ASCMs).

2. "Integration with survey control" means obtaining sufficient measurements from ASCMs into the survey to permit the derivation of grid bearings and the computation of a closure starting at an ASCM and proceeding along the shortest path through the survey to another ASCM or complying with the requirements of Part C, Section 7.1.4 below. GNSS-derived data need not be rotated to the published grid bearing between two ASCMs.

3. The error of closure when compared to the coordinates of the ASCMs, as confirmed and published by the Director of Surveys, shall not exceed the greater of:
   - the product of 0.00014 and the direct distance between the two ASCMs used for the closure, or
   - 0.025 metres.

4. Surveys requiring integration in accordance with Part C, Section 7.1.1 above may instead be integrated:

   (a) by independently tying two points to NAD83 (CSRS) at:
   - 0.05 metres relative accuracy at 95% confidence level; and
   - 0.1 metres absolute accuracy at 95% confidence level through:
     - Natural Resources Canada Precise Point Positioning Service (CSRS-PPP);
     - ASCM(s) with published NAD83 (CSRS) coordinates;
     - provincially integrated active reference station(s) with NAD83 (CSRS) coordinates; and/or
     - observed reference point(s) with NAD83 (CSRS) coordinates from registered integrated plan(s) prepared according to this section;

   or

   (b) by independently tying two points to NAD83 (Original) at:
   - 0.05 metres relative accuracy at 95% confidence level; and
   - 0.1 metres absolute accuracy at 95% confidence level through ASCMs with published NAD83 (Original) coordinates.

All plan requirements (see Part D, Section 1.2: Datum or Origin for Bearings and Coordinates, pages 40 to 41) other than a coordinate table remain applicable, but the closure computation described in Part C, Section 7.1.3 above is not applicable to Section 7.1.4.

5. If a Surveyor performs a survey within the bounds of a survey that has been integrated in accordance with the above requirements, the requirements in Part C, Section 7.1.1 above are optional.

7.2 Plan of Survey

A plan of a survey performed pursuant to Part C, Section 7.1 (Requirements) above shall show, in addition to the requirements of any enactment, all ASCMs to which the survey is connected, together with inter-connections determined by the Surveyor during the course of the survey. The plan must include the unique identifier number and tablet markings for the ASCMs.

7.3 Connection to Survey Control

On every survey for which a plan is to be registered under the *Land Titles Act* or the *Métis Settlements Land Registry Regulation* other than surveys meeting the requirements of Part C, Section 7.1 (Requirements) above, the Surveyor shall make physical ties to survey control, connecting the survey to all ASCMs situated within one kilometre of any monument found or placed by the survey unless the survey has been integrated under Part C, Section 7.1.4 above.

7.4 Non-Monumented Survey

1. A survey shall not be carried out under Section 47 of the *Surveys Act* unless the survey is related to a minimum of two Alberta Survey Control Markers (ASCMs).

2. The density of the reference control network shall be such that no point established by the survey that is to be monumented is more than 600 metres from the nearest reference control marker, monument, or ASCM. For urban subdivision surveys, the Surveyor shall ensure a denser reference control network such that no property corner established by the survey that is to be monumented is more than 200 metres from the nearest reference control marker.

3. A survey under Part C, Section 7.4 must comply with the requirements of:

    - Part C, Section 7.1.4 (Integrated Surveys) on pages 32 to 33;
    - Part D, Section 1.2.2 (Datum or Origin for Bearings and Coordinates) on pages 40 to 41; and
    - Part D, Section 1.6 (Delayed Posting) on pages 42 to 43.

7.5 Plan of Non-Monumented Survey

Plans for surveys performed under Section 47 of the *Surveys Act* shall show, in addition to the requirements of any enactment, the following:

1. The location of all ASCMs, reference control markers, found monuments, and re-established monuments involved in the survey, together with their coordinate positions.

2. The location of all monuments that would have been placed if the survey had been carried out under Section 45(1) of the *Surveys Act*, together with their coordinate positions.

Section 8: Director of Surveys Road Allowance Policy

8.1 66-Foot and 99-Foot Road Allowances

1. For all surveyed lines, the width of the road allowances shall be maintained as that shown on the official Township Plan. In cases where two different widths are shown on adjacent plans, the width shown on the most recent plan shall be used.

2. For all unsurveyed lines, the widths shall be established as 99 feet (1½ chains).

3. For correction lines with only one limit surveyed and shown as 66 feet (1 chain) on the official Township Plan, an 82.5-foot (1¼ chain) road allowance shall be established.

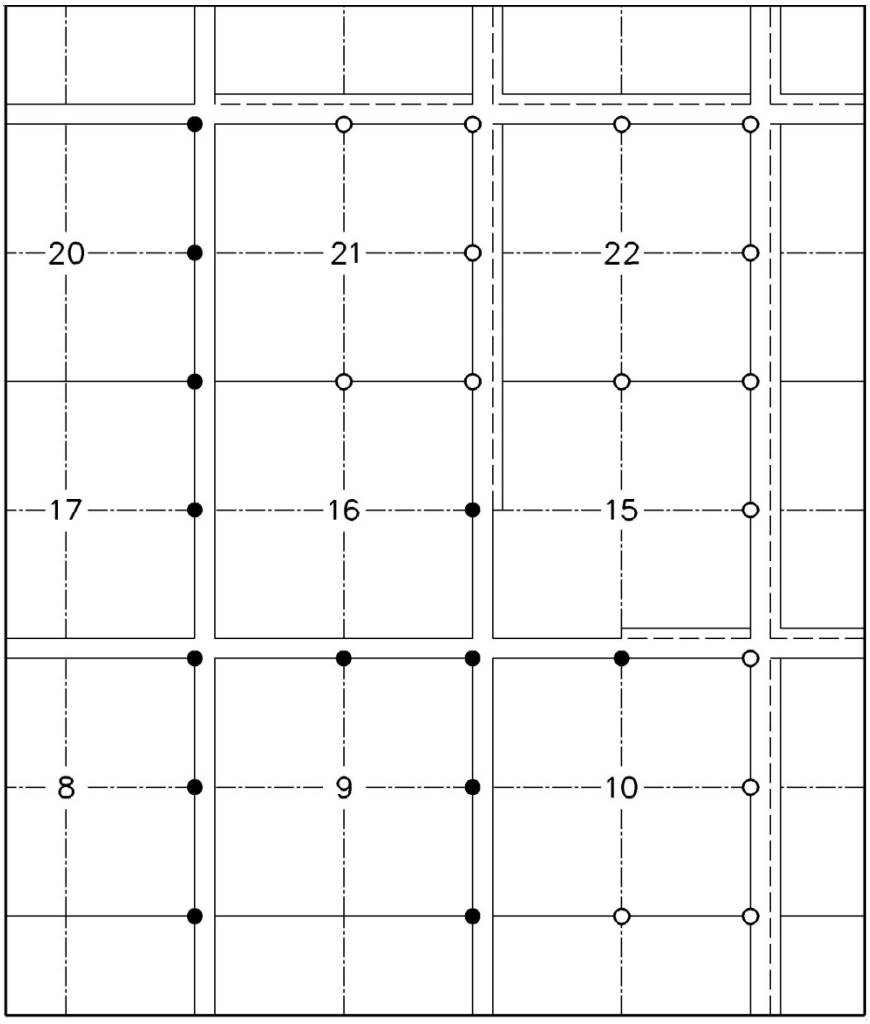
4. The transition from a 66-foot road allowance to a 99-foot road allowance shall follow these guidelines:

   - Part C, Section 8.2: Guidelines for Partially Surveyed Townships, page 35
   - Part C, Section 8.3: Guidelines for Correction Lines, page 36

8.2 Guidelines for Partially Surveyed Townships

On all boundaries except those along correction lines, the limit of the road allowance shall jog 33 feet, at approximately right angles (depending on the direction of the section or quarter section line), beginning at the position of the last corner defining a 66-foot road allowance.

In the diagram below, the N ¼ 10 is the last corner defining a 66-foot allowance and the 33-foot jog begins there. The E ¼ 16 and the NE 20 are similar examples.

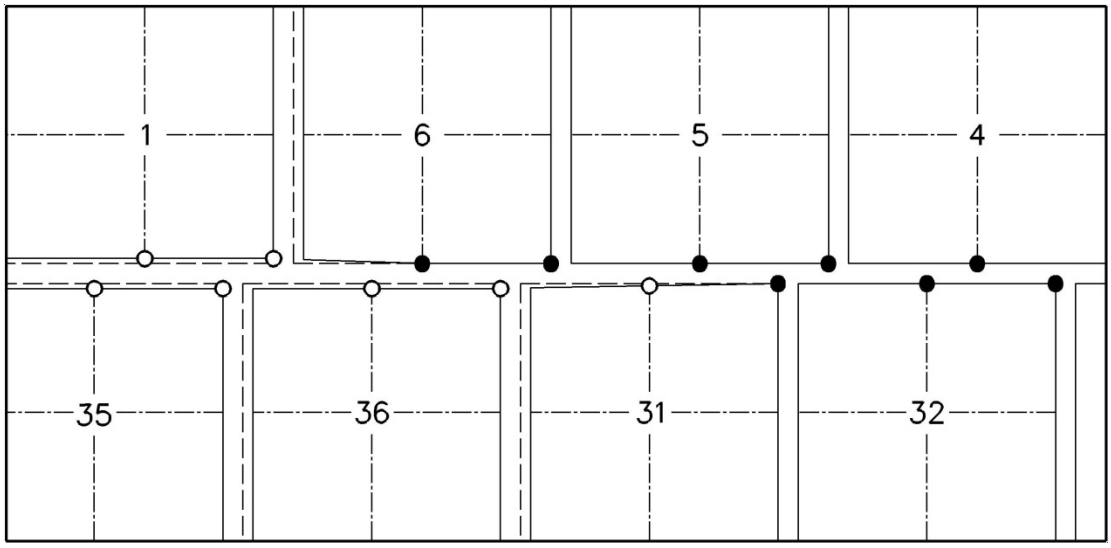


Partially Surveyed Township Diagram

8.3 Guidelines for Correction Lines

Along correction lines, the limit of the road allowance shall taper from the position of the last corner defining a 66-foot road allowance to the nearest section corner defining a 99-foot road allowance.

In the diagram below, the NE 31 is the last corner defining a 66-foot road allowance, the NE 36 is the nearest section corner defining a 99-foot road allowance, and the limit tapers one mile. In Section 6, the S ¼ 6 is the last corner defining a 66-foot road allowance, the SE 1 is the nearest section corner defining a 99-foot road allowance, and the limit tapers ½ mile.



Correction Line Diagram

Note: The 33 feet (½ chain) required to create a 99-foot road allowance shall be taken from the quarter sections adjacent to the east and north limits of the road allowances, with the exception being on correction lines, where 16.5 feet (¼ chain) shall be taken from the quarter sections adjacent to both the north and south limits of the road allowances.

Section 9: Digital Survey Information

Digital survey information is survey information, whether in raw or processed form, that is provided in any digital medium and that an end user or recipient could alter or manipulate.

9.1 Removal of Data from Digital Files

Before digital survey information is provided to clients or third parties, all digital signatures, seals, permit stamps, and proprietary information should be removed from the files.

The removal of raw survey data, such as point nodes and feature attributes, is also recommended unless the contract requires the provision of raw survey data.

9.2 Release of Digital Data

Before digital survey information is released, the recipient should sign a digital data release agreement that specifies, at minimum, the recipient's responsibility to use the digital survey information only for its intended purpose. The agreement should be drafted under the guidance of a legal expert.

Client approval must be obtained before digital survey information is provided to a third party.

9.3 Metadata

Metadata is information regarding the content and context of the digital information with which it is paired. In a survey context, this may include, but is not limited to, information regarding the data collection methods and dates, who collected the data, the purpose and accuracy of the data, and the coordinate system and datum.

Metadata should be included with the release of digital survey information. It may be provided in a separate text file and/or embedded within the digital information file itself, and should be tailored to the specifics and intended use of each file.

PART D: STANDARD PRACTICE FOR SURVEYS AND PLANS

Section 1: General Requirements for Plans

The *Surveys Act* defines the field requirements for surveys. The *Land Titles Act* and the *Métis Settlements Land Registry Regulation* provide the authority for the registration of plans of survey and specify, to some extent, the information that must be shown on plans.

The information in this Section supplements and expands on statutory provisions to support effective plan preparation. Alberta Land Surveyors should also consult the following for direction:

1. Service Alberta's Land Titles Procedures Manual.
2. Service Alberta's Consolidated Policy and Procedures Manual for the Submission of Digital Plans of Survey for Registration.
3. SPIN2 Help's Documentation Registration Request (DRR) Procedures: Create DRR, Modify DRR, and Search DDRs Related to Land ID.
4. *Métis Settlements Land Registry Regulation*.
5. Métis Settlements Land Registry Registrar's Rules.
6. Abacus Datagraphics' Boundary and Document Gathering Resource (BADGR).
7. Surface Rights Board's documentation.

1.1 Method Used To Re-Establish Corners

A notation shall be placed on the plan of survey describing the method used in re-establishing lost corners if this is not clear. For details, see Part C, Section 5.8 (Lost Monuments on Subdivision Surveys) and Part C, Section 5.9 (Lost Monuments on Township Surveys) on pages 29 to 30.

1.2 Datum or Origin for Bearings and Coordinates

The recognized horizontal datums for spatially-referenced data in Alberta are the North American Datum 1983 (Original) and the North American Datum 1983 (Canadian Spatial Reference System - CSRS). For more information on NAD83 (Original) and NAD83 (CSRS), refer to the Geodetic Fact Sheets available from Alberta Environment and Parks.

NAD83 (CSRS) is an active reference frame so it is essential to note the epoch used.

These datums and related ellipsoids shall be used on all plans of survey registered at the Land Titles Office, Alberta Environment and Parks, or the Métis Settlements Land Registry when plan information relates to grid bearings or grid coordinates.

The map projections chosen must be consistent with the requirements of the Provincial mapping system. 3TM is used within urban cadastral areas (the former MISAM or Municipal Integrated Survey and Mapping areas) and UTM is used for the remainder of the province. A list of these areas is included in Geodetic Fact Sheet 10 available from Alberta Environment and Parks, and a description of their physical boundaries can be obtained from the associated ASCM urban and rural index maps on the Alberta Environment and Parks website. Survey plans that overlap differing projection areas should be prepared in only one projection, chosen at the Surveyor's discretion. When appropriate, the Surveyor should adhere to the projection used for adjacent registered plans.

The recommended vertical datums for spatially-referenced data in Alberta are CGVD28 (Canadian Geodetic Vertical Datum, 1928) and CGVD2013 (Canadian Geodetic Vertical Datum, 2013).

The plan of survey shall clearly show the datum or origin used for bearings and coordinates on the plan of survey as outlined below:

1. Unless circumstances require greater accuracy, bearings should be shown to the nearest 5 seconds of arc. Ties to Alberta Survey Control Markers shall reflect the actual angle determined.

2. All plans of survey prepared pursuant to Section 47 of the *Surveys Act* or Part C, Section 7 (Integrated Surveys) on pages 32 to 34 shall show NAD83 (Original) or NAD83 (CSRS) grid bearings and grid coordinates, and contain a note in the grid coordinate listing header and in the legend indicating:
   - the method of integration;
   - the datum used;
   - the projection used;
   - the reference meridian;
   - the combined factor (combining scale factor and elevation factor) used to scale ground distances to the projection plane; and
   - the epoch if using NAD83 (CSRS).

   A note shall also be placed in the legend indicating how the bearings were derived.

   Plans of survey prepared pursuant to Section 47 of the *Surveys Act* may use NAD83 (Original) coordinates only if integrated to ASCMs with published NAD83 (Original) coordinates.

3. A Surveyor who prepares a plan of survey in Unsurveyed Territory shall ensure that it meets the following requirements:
   - Bearings are referred to either the astronomical meridian passing through the centre of the range in which the survey lies or the reference meridian appropriate to survey control, and an explanatory note stating the origin of the bearings is placed in the legend.
   - For wellsite surveys and Official Surveys, ensure that connections to survey control or existing surveys are verified and that positions for all monuments can be determined relative to the position in the Alberta Township System (ATS) of the northeast corner of Section 33 on the Base Line that governs the positions of the theoretical ATS boundaries in the vicinity of the survey.
   - The bearings of lines derived from astronomical observations are shown as such on the plan.
   - On Establishment of Monuments for Wellsite Control Plans, coordinates are shown in a table for points in the survey relative to the northeast corner of Section 33 on the closest Base Line in the range in which the survey lies, oriented to the astronomical meridian through the NE 33.

1.3 Tie Measurements

Linear and angular tie measurements must be shown in all directions from intersections with previously surveyed boundaries.

1.4 Curve Data

Where any boundary or limit of a block, parcel, or right-of-way has been surveyed as an arc of a circular curve, the length of the curve, its radius, and the central angle of curve shall be shown on the plan. Chord lengths and bearings with length of sub-tangents may also be shown but are not essential. When a circular curve boundary is non-tangential to an adjoining line segment boundary, radial bearings or a chord bearing and distance must also be shown.

Note: On subdivision plans with curvilinear boundaries, it may be desirable to show the delta angle to the nearest second of arc and the other curve-related information to millimetre precision. For multiple curves or curve segments, information may be shown in tabular form.

1.5 Closures

Each and every figure on a plan shall be checked for mathematical closure.

1.6 Delayed Posting

Using the delayed posting provisions under the *Surveys Act* is optional. However, this option is recommended where the plan must be registered prior to the completion of construction. In addition to other applicable standards, the following standards apply to delayed posting:

1. The survey and reference control network shall be integrated with a minimum of two Alberta Survey Control Markers (ASCMs) in compliance with the requirements of Part C, Section 7.1.4. Stable reference control markers shall be strategically placed to ensure their maintenance until completion of posting. The reference control network shall be designed to provide for redundancy in observations and to avoid hanging lines or hanging networks.

   Point stability should be the primary consideration in the choice of any new or existing points forming part of the reference control network. For example, magnetic nails in asphalt or lead plugs in concrete are often more stable than statutory iron posts in clay. Surveyors are discouraged from using statutory iron posts as part of the reference control network if they are in close proximity to the anticipated construction.

ASCMs, existing monuments, monuments placed for another purpose under the *Surveys Act*, and reference control markers may all form part of the reference control network.

2. All perimeter monumentation should be placed prior to registration of the plan. At the Surveyor's discretion, perimeter monuments may be delayed when there is a possibility that they will be destroyed during construction.

   When a perimeter boundary is common to a previously registered but unposted boundary, the coordinate positions of the previous plan govern until a Monumentation Certificate (Form 11.1 under Section 77 of the *Land Titles Act*) is registered at the Land Titles Office. The respective Surveyors should coordinate their plans and surveys to ensure that no conflicts arise along the common boundary.

3. In accordance with Section 47(3) of the *Surveys Act*, within one year of the registration of the plan, the Surveyor shall either place the monuments required by Section 45(1) or submit to the Director of Surveys a request for an extension sufficient to complete the placing of the monuments, stating the reason for the request.

   In all cases, the Surveyor shall register a Monument Certificate within the above-specified or formally extended time limits once the placing of the monuments is complete. The certificate shall contain a detailed description of the type and condition of all monuments placed and reasons for non-posting if any monuments were not placed.

4. Every effort shall be made to prepare Section 47 plans on one sheet. However, where two sheets are necessary:

   - The second sheet shall contain only information relevant for the period that the statutory monuments are not in place, including the reference control network and a key plan of point numbers. It may also include the table of coordinates.
   - The second sheet shall be numbered "Sheet 2 of 2" and Sheet 1 of 2 must contain a statement indicating what information is contained on Sheet 2.

5. Grid NAD83 (Original) or NAD83 (CSRS) coordinates must be shown on the plan or on a separate document registered concurrently with the plan.

Section 2: Subdivision Surveys

The statutory requirements of the *Municipal Government Act*, the *Land Titles Act*, the *Métis Settlements Act*, the *Surveys Act*, the *Public Lands Act*, and the related regulations apply to the survey and preparation of plans of subdivision.

Section 3: Strata and Condominium Surveys

Consult these sections of the Land Titles Procedures Manual for specifications and guidelines regarding strata and condominium surveys:

1. Section Sur-2.1: Examination of Strata Space Plans

2. Section Sur-4: Examination of Condominium Plans

The Alberta Land Surveyors' Association's Standards Committee developed a document in 2011 entitled *Strata and Condominium Surveys*. It provides additional information on this subject, and is available under Reference Material on the ALSA website.

Section 4: Right-of-Way Surveys

This Section provides standards supplementary to the *Surveys Act* for surveys of new roads, utility rights-of-way, pipeline rights-of-way, and railways. Alberta Land Surveyors should also consult these sections of the Land Titles Procedures Manual for direction:

1. Section Sur-5: Examination of Road Plans and Other Public Works Plans
2. Section Sur-6: Examination of Right-of -Way Plans, Related Site Plans, and Miscellaneous Plans

For surveys on Métis Settlements Land, Alberta Land Surveyors should consult these sections of the Métis Settlements Land Registry Registrar's Rules for direction:

1. Section Sur-4: Examination of Road Plans and Other Public Works Plans
2. Section Sur-5: Examination of Right-of-Way Plans, Related Site Plans, and Miscellaneous Plans

4.1 Posting Requirements

1. When only one limit of a right-of-way is monumented, the southerly and/or westerly limits are preferred for posting.
2. When surveying a new right-of-way that is adjacent and parallel to an existing right-of-way, monuments shall be placed on the limit that is not an existing right-of-way limit.
3. Subject to the above, monuments shall be placed:
   - at each deflection or terminal point of the limit(s);
   - at each beginning and end of curve;
   - at intervals not exceeding 1,000 metres, except for roads—for which intervals should not exceed 600 metres—and, in either case, at either the interval required to produce intervisibility or the specified interval, whichever is the lesser distance; and
   - at the intersection of the posted limit(s) with each surveyed boundary crossed, including blind lines.

4.2 Termination on Unsurveyed Quarter Line

When a boundary of a right-of-way or road is coincident with, terminates on, or purports to define an unsurveyed quarter line, the unsurveyed quarter line shall be surveyed in accordance with the *Surveys Act* except where the posted limit is within 30 metres of the posted quarter section corner.

In the latter case, the intersection may be made by adopting the bearing determined from the Township Plan or other registered plan. The calculated bearing and measured distance from the existing monument to the new monument shall be shown on the plan. The method chosen for making the intersection should take into consideration the preservation of the survey fabric and land owner concerns.

4.3 Calculated Distances to Unsurveyed Boundaries

Calculated distances shall be shown to unsurveyed quarter lines and parcel boundaries on Right-of-Way Plans (including Road Plans) for rights-of-way that cross unsurveyed quarter lines or unsurveyed parcel boundaries in surveyed territory.

4.4 Right-of-Way Widths

If the right-of-way surveyed has parallel limits, the perpendicular width and any right-of-way widths adopted from previous surveys shall be clearly shown.

4.5 Cancelled or Abandoned Plans

Boundaries shown on cancelled subdivision plans for which no titles exist or on abandoned Right-of-Way Plans need not be intersected. A right-of-way may be considered abandoned when no interest in the right-of-way exists.

To determine the status of current recorded interests, review records at the Land Titles Office, Alberta Environment and Parks, the Métis Settlements Land Registry, and the Alberta Energy Regulator, as well as other available records.

4.6 Partial Abandonment of Road

Where a portion of a previously registered road is abandoned in favour of a new survey, any remaining portion of the previously surveyed road in the same quarter section or parcel should be retraced in the new plan of survey.

4.7 Tie-Backs

On the survey of a right-of-way that terminates within the interior of a section, the terminal monument shall be tied to some other known point so that a closure may be obtained from information shown on the plan.

4.8 Markings on Monuments

If a statutory iron post is placed to re-establish a lost monument originally placed on a road survey, the re-established monument shall be marked with the same designation as the original monument.

Although a marker post shall be placed in accordance with accepted practice, pits shall not be dug or restored.

4.9 New Railway Surveys

When a new railway right-of-way is surveyed and the track has been constructed prior to the survey, the centreline of actual track shall be related to the right-of-way survey and this relationship shall be shown on the plan of survey.

Any spiral curves existing on the centreline of track of a new railway shall be replaced with circular curves for the purpose of posting the railway limits in accordance with the table shown in Part D, Section 4.10 (Spiral Curve Replacement) on page 49.

4.10 Spiral Curve Replacement

When establishing the boundary of a previously surveyed but unposted railway right-of-way with the centreline shown as a spiral curve on the registered plan, the spiral shall be replaced with a circular curve in accordance with the table below. The three types of spiral curve are illustrated in Part D, Section 4.11 (Three Types of Spiral Curve) on pages 50 to 53.

SPIRAL CURVE REPLACEMENT TABLE
(distances are shown in feet and decimals thereof)

Curve Data from Railway Plan			Replacement Curve Data		
D^{o}_{C} & R_C Degree and Radius of Central Curve	L_S Length of Spiral	Δ_S Total Spiral Angle	Δ_R Delta of Replacement Curve	R_R Radius of Replacement Curve	Type of Spiral Curve
2° 2,864.9	180 168 120	1° 48' 1° 40' 1° 12'	1° 48' 1° 40' 1° 12'	3,819.8 4,331.2 3,819.8	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
2° 30' 2,292.0	210 200 150	2° 37.5' 2° 30' 1° 52.5'	2° 37.5' 2° 30' 1° 52.5'	3,055.7 3,359.2 3,055.7	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
3° 1,910.1	240 234 180	3° 36' 3° 30' 2° 42'	3° 36' 3° 30' 2° 42'	2,546.6 2,765.7 2,546.6	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
3° 30' 1,637.3	270 204 210	4° 43.5' 3° 30' 3° 40.5'	4° 43.5' 3° 30' 3° 40.5'	2,182.9 2,412.2 2,182.9	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
4° 1,432.7	300 231 240	6° 00' 4° 40' 4° 48'	6° 00' 4° 40' 4° 48'	1,910.1 2,024.7 1,910.1	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
4° 30' 1,273.6	300 264 270	6° 45' 6° 00' 6° 04.5'	6° 45' 6° 00' 6° 04.5'	1,697.9 1,786.0 1,697.9	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
5° 1,146.3	300 248 300	7° 30' 6° 00' 7° 30'	7° 30' 6° 00' 7° 30'	1,528.2 1,677.2 1,528.2	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
5° 30' 1,042.1	300 279 330	8° 15' 7° 30' 9° 04.5'	8° 15' 7° 30' 9° 04.5'	1,389.3 1,499.7 1,389.3	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
6° 955.4	300 310 360	9° 00' 9° 10' 10° 48'	9° 00' 9° 10' 10° 48'	1,273.6 1,357.2 1,273.6	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral

4.11 Three Types of Spiral Curve

There are three types of spiral curve:

1. Sullivan Spiral
2. Searles Spiral
3. Holbrook Spiral

Drawings and formulae for the three types of spiral curve are provided on the following pages for information purposes only.

The Spiral Curve Replacement Table on the previous page and the three sets of drawings and formulae on the following pages use the symbols defined below.

Symbols:

BC - beginning of curve.

C - chord length.

$\mathbf{D_S}$ - deflection angle (chord ratio).

$\mathbf{D_{100}}$ - total $\mathbf{D_S}$ (deflection angle) from **TS**.

$\mathbf{D^o}$ - degree of curvature (the number of degrees subtended by a 100-foot chord).

$\mathbf{D^o_C}$ - degree of curvature of central circular curve.

$\mathbf{D^o_R}$ - degree of curvature of replacement curve (Sullivan and Holbrook Spirals).

$\mathbf{D^o_S}$ - spiral angle of individual chord.

$\mathbf{L_S}$ - length of spiral.

N - number of chords.

PI - point of intersection.

R - radius of curve (infinite at transition point from tangent to spiral curve).

$\mathbf{R_C}$ - radius of central curve.

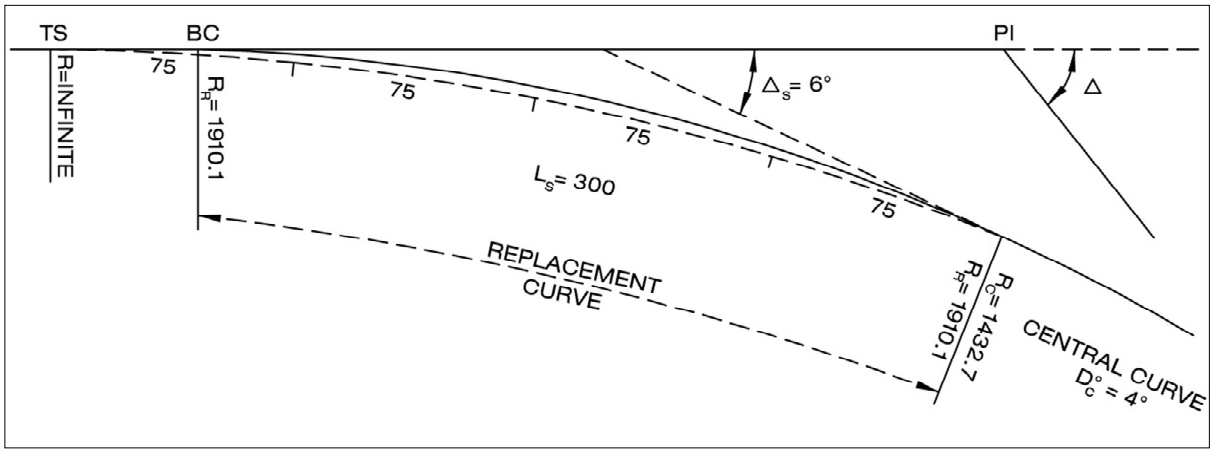
$\mathbf{R_R}$ - radius of replacement curve.

TS - tangent to spiral curve.

$\mathbf{\Delta_R}$ - delta of replacement curve – always the same as total spiral angle.

$\mathbf{\Delta_S}$ - total spiral angle.

1. Sullivan Spiral



The Sullivan Spiral, which is found on the CPR, is a transition curve with a uniform increase in the degree of curvature. The number of degrees of the central curve equals the number of chords in the spiral.

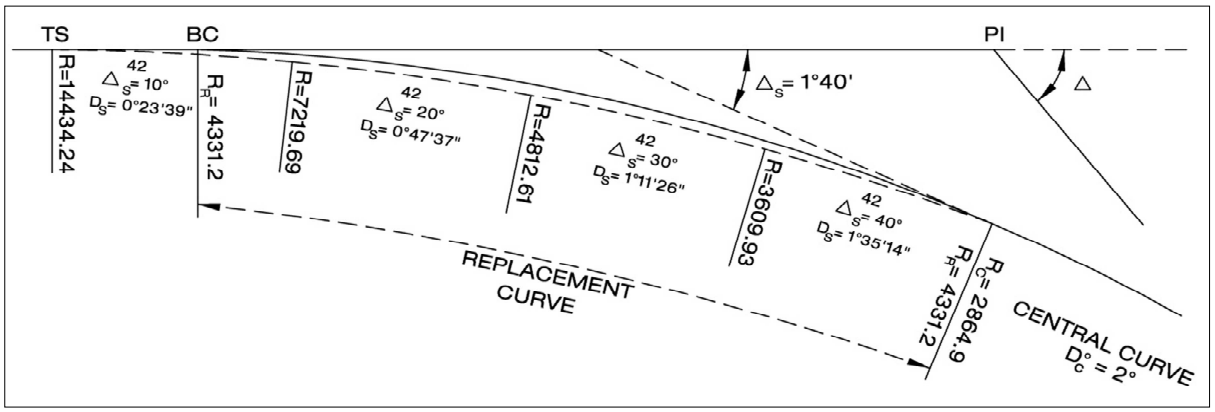
Distances are shown in feet and decimals thereof.

Example: $D_C^o = 4^o$, $L_S = 300$, $N = 4$, $\Delta_S = \dfrac{D_C^o L_S}{200} = 6^o$,

D_R^o of replacement curve = 3/4 D_C^o, $D_R^o = 3^o$, $R = 1910.1$

The Sullivan Spiral uses the number of degrees in the value **$D°_C$** as the number of chords in the value **L_S**. It involves laying out a series of equal chords so arranged that the spiral curve passing through the chord points has zero curvature at the **TS**, 1° of curvature at the first chord point, 2° at the second, and so on, so that at the end of *n* chords, the spiral has n degrees of curvature.

2. Searles Spiral



The Searles Spiral, which is found on the GTPR (now the CNR), is a multi-compound curve of decreasing radii approximating the properties of a cubic parabola.

Distances are shown in feet and decimals thereof.

Example: $D_C^o = 2^o$, $L_S = 168$, $N = 4$, chord $= 42$, $X = 1.832$,

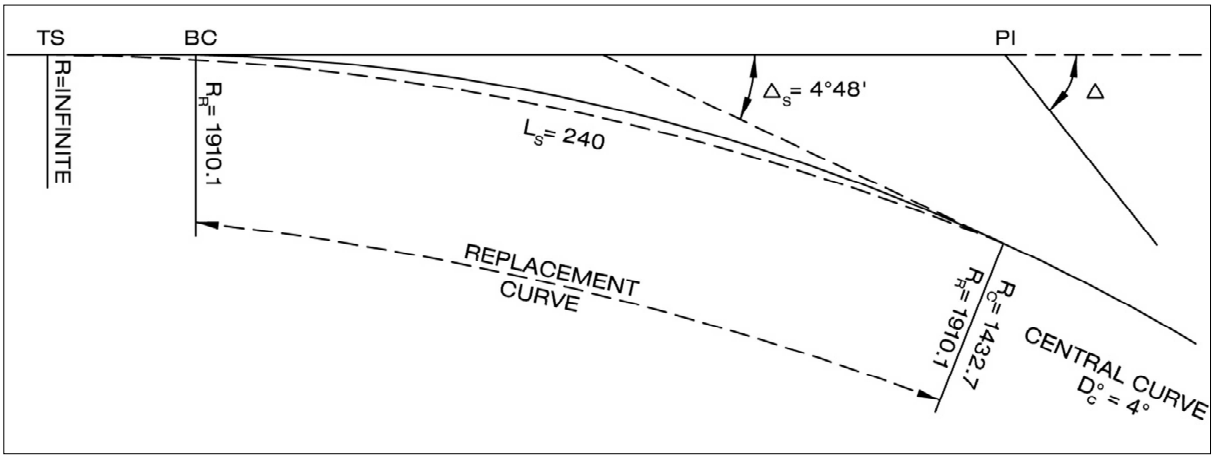
$$R_R = \frac{X}{(1-\cos \Delta_S)} \text{ of spiral short tangent, Total } \Delta_S = 1^o40', \; R_R = 4331.2$$

$$\text{The first chord ratio is } D_S = \frac{100}{\text{chord length}} \times 10 \text{ minutes}.$$

$$\text{More generally, } \sin 1/2\, D_S = \frac{100 \sin 1/2\, D_{100}}{\text{chord length}}.$$

The Searles Spiral is distinctive in that it is not a spiral. Instead, it is a series of compound curves with diminishing radius to that of the fixed radius of the central simple curve. Like the Holbrook and Sullivan Spirals, this curve approximates the properties of a cubic parabola. The difference is that it is not uniform throughout.

3. Holbrook Spiral



The Holbrook Spiral, which is found on the CNR, is a transition curve with a uniform increase in the degree of curvature. The number of minutes in the $D°_R$ is equal to the number of feet in the spiral length. Therefore, degree of curvature increases 1 minute per foot of L_S.

Distances are shown in feet and decimals thereof.

Example: $D^o_C = 4^o$, $L_S = 240$, $\Delta_S = \frac{D^o_C L_S}{200} = 4^o48'$, D^o_R of replacement curve = 3/4 D^o_C,

$D^o_R = 3^o$, $R = 1910.1$

The Holbrook Spiral is a spiral of uniform, continuously increasing degree of curvature to that of a fixed degree of the central curve. It is distinctive in that the degree of curvature increases one minute for each foot of spiral length. For sharper curves, the degree of curvature increases two minutes for each foot of spiral length.

4.12 Definition of Railway Tangent

When establishing the location of a railway right-of-way based on an existing centreline of track, a statutory iron post shall be placed to define the tangent for subsequent use. The post shall be tied to the survey being conducted and shall be located at least 500 metres from the survey being conducted or near the next point of curvature, whichever is nearer.

4.13 Rail Line As-Located Surveys

Existing rights-of-way based on "location" plans may or may not correspond to actual rail location since "as-located" surveys were conducted prior to rail construction. If it is found that the existing centreline of track agrees reasonably with the centreline as shown on the plan, it is likely that this is the best evidence of the original survey line. If not, an alternative procedure appropriate to the circumstances may be required.

4.14 Railway Centreline

Existing rights-of-way based on "as-constructed" or "as-built" surveys will generally refer to the centreline of track existing at the time of survey, and ownership is based on the location of this centreline. The centreline of track is therefore usually the best evidence of the original survey line, provided that no movement has occurred since the original survey.

4.15 Facility Surface Lease

A facility surface lease may be for a wellsite, installation, or other appurtenance over which the Alberta Energy Regulator has jurisdiction and that is associated with the recovery or processing of hydrocarbon-based resources or any associated substances or wastes. An appurtenance may be a plant, battery, compressor, dehydrator, separator, or treater as defined in the *Oil and Gas Conservation Act* or a central processing plant or satellite plant as defined in the *Oil Sands Conservation Act*. Pipeline rights-of-way are required under the *Pipeline Regulation* for hydrocarbon-based pipelines constructed outside a facility surface lease.

Section 5: Wellsites

This Section deals with the survey of drilling locations that require Alberta Energy Regulator (AER) licensing. Surface tenure on patented lands is normally protected by caveats registered at the Land Titles Office or the Métis Settlements Land Registry, whereas interests in unpatented public lands are handled by the Minister responsible under the *Public Lands Act*, and are addressed in Section 6: Public Land Dispositions on pages 58 to 63.

5.1 Environmental Conditions Affecting Well Licensing

Alberta requires operators of upstream oil and gas facilities in environmentally sensitive areas to conserve and reclaim land and to mitigate the effects of their activities. For specifications and guidelines, consult the Alberta Environment and Parks Fact Sheet entitled *Siting an Upstream Oil and Gas Site in an Environmentally Sensitive Area on Private Land*.

5.2 Reference Boundary

1. An Alberta Land Surveyor performing a survey for the location of wellsites in surveyed territory shall locate and confirm sufficient monuments within, on, or defining the section in which the facilities are located to determine the position of the wellsite in relation to the section boundaries. The word "monuments" here refers to those placed in accordance with Part 2 or Part 3 of the *Surveys Act*.

2. An Alberta Land Surveyor performing a survey for the location of wellsites in Unsurveyed Territory shall locate and confirm sufficient monuments to determine the position of the wellsite in relation to the theoretical section boundaries. The word "monuments" here refers to:

    - monuments placed in accordance with Part 2 or Part 3 of the *Surveys Act*;
    - monuments shown on a Wellsite Control Plan on file with the Director of Surveys Office;
    - monuments shown on an Establishment of Monuments for Wellsite Control Plan registered at the Land Titles Office;
    - monuments shown on a plan of survey signed by an Alberta Land Surveyor and registered at Alberta Environment and Parks on or after August 1, 2009; or
    - Alberta Survey Control Markers (ASCMs) directly connected to Part 2 or Part 3 monuments that define the theoretical section boundaries.

    Theoretical section boundaries shall be determined using the *Supplement to the Manual of Instructions for the Survey of Canada Lands*.

5.3 Surveys Act

Where the boundaries of a wellsite or related facility purport to define a property boundary, the said boundary shall be defined in accordance with the *Surveys Act*, excepting thereout the provisions of Sections 44(3) and 46(3), to define the boundaries of the parcel.

However, when an access road in surveyed territory crosses or terminates on a property boundary, the intersection may be calculated, in which case the plan shall clearly indicate that the intersection is calculated.

5.4 Wellsite Control

Wellsite Control Plans were formerly called Wellsite Traverse Plans or Wellsite Control Traverse Plans. Plans submitted prior to December 1, 1997 are still available from the Director of Surveys Office.

When performing a survey for a wellsite in Unsurveyed Territory, an Alberta Land Surveyor is required to place wellsite control monuments if the wellsite is more than 10 kilometres from the monuments required to satisfy Part D, Section 5.2.2 above.

When placing wellsite control monuments, the Surveyor shall:

1. Place a minimum of two statutory iron posts not further than 1,000 metres from the wellsite.

2. Show the wellsite control monuments on the wellsite plan signed by the Surveyor for registration at Alberta Environment and Parks.

3. Meet the requirements of Part C, Section 3.9 (Establishment of Monuments Plan) on page 21 if the wellsite plan is not registered at Alberta Environment and Parks.

5.5 Monumentation

Refer to Part C, Section 3.10 (Wellsites and Related Facilities) on page 21.

5.6 Accuracies

Refer to Part C, Section 1.6 (Wellsite Surveys) on page 14.

5.7 Wellsite Plan Requirements

1. A Wellsite Survey Plan shall include, at minimum, the following administrative information:
    - name of licensee (applicant);
    - name of survey corporation and/or Alberta Land Surveyor;
    - dates of survey and any revisions; and
    - ALS Certification for Wellsites on Private Land (see Part E, Section 1, page 80) or ALS Statutory Declaration for Public Land Dispositions.

2. For technical requirements and guidelines, consult *Directive 056: Energy Development Applications and Schedules*.

3. A Wellsite Survey Plan in Unsurveyed Territory shall clearly identify the survey evidence used as the datum and show the coordinates of the datum point or points relative to the northeast corner of Section 33 on the Base Line that governs the positions of the theoretical Alberta Township System (ATS) boundaries in the vicinity of the wellsite.

Section 6: Public Land Dispositions

Before carrying out surveys involving public lands, an Alberta Land Surveyor should be familiar with public land disposition types and the approving authority's plan requirements.

Information about public land dispositions is available in the Alberta Environment and Parks (AEP) document entitled *Handbook of Instruments Pursuant to Public Lands Act & Public Land Administration Regulation (PLAR)* and on the Alberta Energy Regulator (AER) website.

A list of disposition types is available in the AEP documents entitled *Public Lands Disposition Application Requirements Reference Table* and *Public Lands Administration Regulation (PLAR) Tables A1 and A2*.

Information about plan types, monument requirements, plan formats, and content requirements is available in the AEP documents entitled *Public Lands Administration Regulation (PLAR) Tables A1 and A2* and *Content Requirements for Survey Plans and Sketches*.

6.1 Public Land Dispositions Except Access Roads

It is necessary to accurately define the location of activities and dispositions on public lands so that the approving authority does not grant conflicting authorizations on the same land. This is accomplished by requiring applicants to provide a detailed plan showing the location of the land for which the applicant is applying in relation to known survey evidence.

When determining the boundaries of public land dispositions, an Alberta Land Surveyor should be guided by the following criteria:

1. Where the disposition boundaries are surveyed and monumented, the boundaries shall be defined by the monuments placed for that purpose.

2. Where the disposition boundaries are surveyed and not monumented, the boundaries shall be defined by the best evidence governing those boundaries.

3. Where the disposition boundaries are not surveyed, the boundaries shall be defined by the best physical evidence governing those boundaries.

When conducting a survey and preparing a plan for a public land disposition, an Alberta Land Surveyor shall:

1. Mark the positions of the boundary lines to be established by placing monuments at every change in direction and at the beginning and end of every curve. The type of monument to be placed is stipulated in the Alberta Environment and Parks (AEP) document entitled *Public Lands Administration Regulation (PLAR) Tables A1 and A2*.

2. Intersect and monument all surveyed section boundaries crossed.

3. When surveying public land dispositions that require monumentation to be statutory iron posts, intersect and monument existing public land disposition boundaries that are defined by statutory iron posts and crossed by the new disposition.

4. In surveyed territory, locate and confirm sufficient monuments within, on, or defining the section in which the disposition is located to determine the position of the disposition in relation to the section boundaries. The word "monuments" here refers to those placed in accordance with Part 2 or Part 3 of the *Surveys Act*.

5. Derive and reference the bearings of all surveyed lines in accordance with Part D, Section 1.2 (Datum or Origin for Bearings and Coordinates) on pages 40 to 41.

6. Verify all bearings and distances to the level of accuracy specified in Part C, Section 1.6 (Wellsite Surveys) on page 14 except ties identified in Section 6.1.7 immediately below.

7. Make sufficient field measurements to ensure that there are no errors of layout or measurement, and show these measurements on the plan.

8. Show and label on the plan all public land dispositions crossed or adjacent to the proposed activity.

9. Prepare the plan in accordance with Part D, Section 1 (General Requirements for Plans) on pages 39 to 43 and the approving authority's plan requirements.

10. Certify the plan in accordance with the ALS Statutory Declaration for Public Land Dispositions as shown in the Director of Surveys' document entitled *Director of Surveys Policy – Surveys Act*.

6.2 Remote Sensing for Public Lands Dispositions

When preparing a public land disposition or a portion of a plan on public lands based on remotely sensed survey data such as LiDAR, provided that monumentation is not required in accordance with Alberta Environment and Parks' *Public Lands Administration Regulation (PLAR) Tables A1 and A2* and provided that there are no affected adjoining interests, an Alberta Land Surveyor shall:

1. Use remotely sensed data only if it can be demonstrated that it meets accuracy standards of 0.5 metres vertically (if applicable) and 2.0 metres horizontally with respect to Alberta Survey Control Markers (ASCMs), NAD83 (CSRS) active reference frame, or other published benchmarks in the area at the 95% confidence level.

   Verifying this may include obtaining the calibration data and testing the collection method for quality assurance, comparing the data to data for a sample of areas surveyed using proven techniques, and comparison with points that have published horizontal and vertical positions.

2. Visit the subject area to confirm that all relevant topography has been identified and shown on the plan. For example, the Surveyor may find small creeks that were not discernible in the data.

3. Tie the beginning and end points of the survey to existing surveys, which include the Alberta Survey Control System, surveyed section boundaries, plans of survey registered at the Land Titles Office, Wellsite Control Plans, and monumented disposition surveys.

4. Identify positions to be established (corners, changes in direction, and beginnings and ends of curves) with a symbol that is represented in the legend as a "remotely sensed position."

5. Note on the plan when the remotely sensed data was collected and the data collection technique used.

6. Prepare the plan in accordance with Part D, Section 1 (General Requirements for Plans) on pages 39 to 43 and the approving authority's plan requirements.

6.3 Establishment of Disposition Boundaries for Existing Access Roads

This sub-section does not apply to access roads included in a surface lease disposition with monumented boundaries.

An Alberta Land Surveyor performing a public land disposition survey for an existing access road shall:

1. Survey the location of the existing access road. The disposition boundaries shall be determined from the best available evidence, which will include but not be limited to adjacent surveyed disposition boundaries, existing survey plans, centreline of existing road, edge of ground disturbance, edge of surface vegetation disturbance, grade development, surface improvements, and information gathered from remote sensing data as indicated in Section 6.2 (Remote Sensing for Public Lands Dispositions) on page 60. The placement of monuments, marker posts, and bearing trees is not required.

2. Tie the beginning and end points of the survey to existing surveys, which include the Alberta Survey Control System, surveyed section boundaries, plans of survey registered at the Land Titles Office, Wellsite Control Plans, and monumented disposition surveys.

3. Derive and reference the bearings of all surveyed lines in accordance with Part D, Section 1.2 (Datum or Origin for Bearings and Coordinates) on pages 40 to 41.

4. Verify all bearings and distances to the level of accuracy specified in Part C, Section 1.6 (Wellsite Surveys) on page 14.

5. Prepare the plan in accordance with Part D, Section 1 (General Requirements for Plans) on pages 39 to 43 and the approving authority's plan requirements.

A common boundary or parallel overlap between an existing access road disposition and other existing dispositions can be shown on the plan using a combination of sufficient monument ties and measurements from the existing disposition plan. Only significant gaps and overlaps must be labelled on the plan.

6.4 As-Built Surveys for Disposition Amendments and Renewals

An Alberta Land Surveyor performing an as-built survey for the purpose of disposition amendment or renewal shall ensure that the survey is a current representation of the constructed extents of the disposition and that the survey fully stands on its own merits. Found and placed evidence from the precedent disposition plan should be confirmed, restored, or re-established as necessary in accordance with the applicable sections of the Manual of Standard Practice.

6.5 Disposition Plans Showing Activity on Private and Public Lands

When surveying linear activities on private and public lands, an Alberta Land Surveyor shall refer to the acceptable methods listed in the Alberta Environment and Parks (AEP) document entitled *Content Requirements for Survey Plans and Sketches*.

Factors to be considered when determining which method to use may include:

- the disposition type (PLA/DPL, LOC/DLO, EZE);
- the relative length on private and public lands;
- whether or not the plan is also being used for purposes other than land application, such as construction and/or licensing; and
- whether the plan is a pre-construction plan or an as-built plan.

If preparing a single plan, the Alberta Land Surveyor shall ensure that areas are segregated and that the plan clearly differentiates between private and public lands.

6.6 Lease Disposition Plan Amendments

An Alberta Land Surveyor performing a lease disposition plan amendment (maximum 10 hectares) shall locate and confirm by measurement sufficient evidence within, on, or defining the disposition to allow the determination of the boundaries. The amendment field survey shall not span more than 24 months.

The Surveyor shall:

- indicate pre-existing disposition survey evidence as found, restored, or re-established; and
- indicate the actual dates of the amendment field survey.

For information on public land disposition amendments, refer to the Alberta Environment and Parks document entitled *Survey Manual – Public Land Surveys*.

6.7 Statutory Declarations

Section 14.0 (Final Submission) of Alberta Environment and Parks' *Enhanced Approval Process (EAP) Manual* refers to the submission of a completed Alberta Land Surveyor's Statutory Declaration form for disposition types that require a Plan of Survey.

Before signing a statutory declaration, an Alberta Land Surveyor shall confirm in the field that all the facilities were constructed entirely within the survey boundaries as represented on the disposition Plan of Survey on file with Alberta Environment and Parks, and shall ensure that the field verification is documented in accordance with Part C, Section 6 (Field Notes) on page 31.

In the event that the pipeline activities subject to a PLA disposition, as described in Public Land Administration Regulation (PLAR) Table A2, were not constructed entirely within the survey boundaries as represented on the PLA disposition Plan of Survey on file, a Plan of Survey for the amendment of the PLA disposition should be prepared. The amended disposition boundaries must cover all constructed pipeline activities under the PLA disposition.

Section 7: Descriptive Plans

This Section provides specifications and guidelines for the preparation of Descriptive Plans.

Alberta Land Surveyors should also consult either the Land Titles Procedures Manual and its Section Sur-3: Examination of Descriptive Plans or the Métis Settlements Land Registry Registrar's Rules and its Section Sur-3 Examination of Descriptive Plans for direction.

Alberta Environment and Parks does not accept descriptive plans.

7.1 Subdivisions

For creation of new boundaries by subdivision, the Surveyor shall undertake sufficient research, including a field inspection if necessary, in order to:

- ensure that the boundaries being created by the Descriptive Plan are consistent with the intent of the subdivision;
- confirm that all improvements lie within the boundaries of the proposed parcel; and
- confirm that no encroachments exist onto the subject property from adjacent lands.

7.2 Natural Boundaries

Where a Descriptive Plan includes a natural boundary, the Surveyor should conduct a field inspection to confirm the location of the natural boundary.

7.3 Field Inspection Statement

Place one of the following statements on the Descriptive Plan:

- No field inspection was carried out and boundaries were not established on the ground.
- A field inspection was carried out on _____ (month) _____ (day), 2____, but boundaries were not established on the ground.

Section 8: Real Property Reports

A Surveyor performing a survey to identify, locate, and illustrate improvements on a parcel of land and the extent of that parcel shall prepare an Alberta Land Surveyor's Real Property Report in accordance with this Section. See also Part E, Section 1 (ALS Certifications – Alberta Land Surveyor's Real Property Report, pages 78 to 79).

8.1 Definition of Improvement

In this Section, the word "improvement" refers to any visible structure of a permanent nature, constructed or placed on, in, or over land.

See also Part D, Section 8.5 (Improvements) on pages 67 to 68.

8.2 Surveys Act

A Surveyor performing a survey to prepare an Alberta Land Surveyor's Real Property Report shall locate and confirm sufficient survey monuments to define the boundaries of the parcel in accordance with the *Surveys Act* excepting thereout the provisions of Sections 44(3) and 46(3).

8.3 Research

When conducting a survey for an Alberta Land Surveyor's Real Property Report, a Surveyor shall perform sufficient research to identify the parcel boundaries. A copy of the Certificate of Title that reflects the status of the property on the date of survey is to be retained in the file.

8.4 Plan Requirements

A plan for an Alberta Land Surveyor's Real Property Report shall show:

1. The legal description, municipality, and (where available) municipal address of the parcel.
2. The legal description of all lands adjoining the parcel.
3. That the plan is an "Alberta Land Surveyor's Real Property Report" (to be shown prominently).
4. All improvements as specified in Part D, Section 8.5 (Improvements) on pages 67 to 68.
5. The nature of each improvement illustrated and, if it is incomplete, the current stage of its construction.
6. Any existing encroachment and the amount of the encroachment (to be shown clearly and prominently).
7. The length and bearing of each boundary of the subject parcel.
8. The survey monuments used to define the perimeter boundaries and the relationship of the monuments to those boundaries.
9. "Fd No Mk" at all locations where survey evidence was not found.
10. The condition of monuments recorded in the field notes as stipulated in Part C, Section 6.2.5 (Content of Field Notes) on page 31.
11. A note on the plan containing the copyright symbol, the name of the Surveyor holding the copyright, and the current year.
12. All utility rights-of-way and easements that affect the extent of title, dimensioned and labelled.
13. A note identifying all other surface interests affecting the extent of title.
14. Certification in accordance with Part E, Section 1 (ALS Certifications – Alberta Land Surveyor's Real Property Report, pages 78 to 79).

8.5 Improvements

The improvements to be shown on the plan for an Alberta Land Surveyor's Real Property Report include, at minimum, the following:

1. All buildings and projections therefrom, together with their dimensions. Minimum setback dimensions shall be shown from the boundaries of the subject parcel to exterior walls and/or foundation as required by the municipality. A statement clarifying the extent of setback dimensions is to be shown.

2. The measured location of common wall(s) and their relationship to the property line (e.g., "property line falls within the common wall" or "property line does not fall within the common wall; see dimensions on Detail A") in cases where a building that is subject to the Real Property Report is an attached dwelling, a semi-detached dwelling, or another form of construction where a shared common wall is present, and where there is an intent for a property line to fall within one or more common wall(s).

   If measurements are not obtainable, the Surveyor shall note on the Real Property Report that the common wall(s) have not been measured and either that their shown location(s) have been assumed from dimensions on building plans or that the wall(s) have not been shown.

3. Eaves, dimensioned to the line of the fascia or foundation, together with a note showing this in the legend.

4. Driveways if they encroach onto the adjacent parcel.

5. Eavestroughs, steps, and landings if they encroach onto the adjacent parcel, street, or lane.

6. All permanent sheds and their dimensions.

7. Retaining walls that appear to define property lines or that encroach onto adjacent parcels, rights-of-way, streets, or lanes.

8. Utility poles and pedestals if they encroach onto the subject parcel.

9. Decks and their height above ground.

10. In-ground swimming pools.

11. In urban areas, fences that appear to define property lines. Indicate in the legend that all fences are within 0.2 metres of the property line unless otherwise noted. Fences more than 0.2 metres from the property line shall be dimensioned. Fences shall not be indicated as encroaching unless the encroachment is onto public lands.

    To avoid confusion and conflict, fence ownership should not be inferred.

12. Adjacent municipal sidewalks and curbs, together with the distance from the property line to the back of each sidewalk and curb.

8.6 Rural Real Property Reports

1. Locate and confirm evidence to define the perimeter boundaries of the parcel. If this is not practical, locate and confirm sufficient evidence to define, at minimum:
    - one boundary for parcels greater than 8 hectares.
    - two boundaries on different sides for parcels greater than 1 hectare but less than 8 hectares.

2. Critical boundaries, with encroachments or improvements close to minimum setback or side yard requirements, must be defined in accordance with the *Surveys Act*.

3. Calculated distances may be derived from prior plans of survey but must be explained within the Real Property Report.

4. Fence lines are to be shown at the Surveyor's discretion. If they are not shown, the fence line statement should be removed and replaced with a statement that acknowledges the existence of fence(s) and indicates that they are not shown.

8.7 Updated and Re-Issued Reports

A field inspection and confirmation of title is required to update old Real Property Reports. Previous Reports shall not be re-issued unless they are brought up to date and they conform to current standards.

8.8 Authentication

To identify original Real Property Reports, each original Report shall bear a permit stamp, if applicable, and an ink or digital signature.

Section 9: Official Surveys

It is good practice for Alberta Land Surveyors engaged in Official Surveys to involve the appropriate offices early in the process.

9.1 Provincial Lands

Official Surveys pursuant to the *Surveys Act* require official instructions from the Director of Surveys. Official Surveys under the *Surveys Act* include:

- Townships
- Settlements
- Métis Settlements
- Re-surveys of public lands and Métis patented land

9.2 Canada Lands

Surveys of Canada Lands pursuant to the *Canada Lands Surveys Act* require specific instructions from the Surveyor General of Canada.

Section 10: Construction Layout Surveys

When performing construction layout surveys, the following guidelines apply:

1. Field and office copies of the complete set of construction drawings designated as "Approved for Construction" should be obtained before commencing any site layout survey.

2. The construction drawings should be reviewed and any discrepancies or ambiguities clarified prior to the site layout survey. No assumptions should be made as to any position on the plans.

3. The layout should be pre-computed and sufficient checks performed to ensure that the layout is consistent with the original construction drawings.

4. Sufficient research should be carried out to ensure that the Surveyor has all information available to define the site boundaries, and the Surveyor should use a survey methodology that will produce the required accuracy.

5. Horizontal and vertical control to be used for the project should be verified prior to commencement of any site layout survey.

6. The Surveyor should verify who is responsible for locating underground facilities within the construction area.

7. If any changes to the location or dimensions of the facilities are requested, the revisions should be in writing and signed by an authorized person. This also applies to any positioning determined by site conditions.

8. Independent check-ties should be completed to identify any inconsistencies in layout and these should be rectified prior to construction.

9. In no instance should the Surveyor allow construction to begin where the layout has not been verified. If insufficient time is allowed to verify the field work, the field notes should be inspected and signed by an authorized person.

Section 11: Geometrical Deformation Survey Guidelines

Geometrical deformation surveys are performed to detect and measure movements, and can be used to complement more traditional deformation measurements usually performed by structural and geotechnical engineers. Surveyors are advised to consider the following guidelines when undertaking a geometrical deformation survey.

11.1 Expectations and Requirements

- nature of the deformation survey – relative or absolute
- accuracy required to detect the geometrical displacement
- observation period and frequency
- external effects and physical attributes of the deformable body

11.2 Network Design Monitoring

- instrumentation
- configuration – geometry and datum defects
- observations – number, type, and geotechnical considerations
- pre-analysis with appropriate observational weights
- environmental influences

11.3 Monumentation

- appropriate reference and object monuments/targets
- stability of reference and object monuments/targets
- logistics and site conditions

11.4 Equipment

- calibration – techniques, frequency, analysis, and implementation
- adjustment

11.5 Observation Procedures

- standardization between epochs
- environmental factors
- data monitoring and recording
- quality assurance/quality control and confirmation of expected results

11.6 Data Analysis

- pre-processing and reduction
- reduction network adjustment
- practical observation weighting scheme
- "best" definition of a common datum
- rigorous geometrical deformation analysis

11.7 Reporting

- history
- methodology
- results of individual epochs
- geometrical displacements
- quality of the geometrical displacements
- conclusions

Section 12: Métis Settlements Land Registry

When conducting a survey on a Métis Settlement, an Alberta Land Surveyor must register the plan with the Métis Settlements Land Registry. A client requesting a survey on a Métis Settlement should be advised that the plan has no effect unless so registered.

Métis Settlements Land Registry plan requirements are similar to those of the Land Titles Office with a few exceptions:

- The Registry block refers to the Métis Settlements Land Registry.
- The plan must be on mylar.
- It is preferred that the Alberta Land Surveyor's Statutory Declaration be on the plan rather than separate.

Detailed plan requirements are available in Part 8, Division 6 of the *Métis Settlements Land Registry Regulation*.

Section 13: Hybrid Cadastre Surveys

This Section deals with public lands disposition surveys conducted under the *Hybrid Cadastre Standards for Public Lands Disposition Surveys* established by the Director of Surveys.

At the discretion of the practitioner, a hybrid plan of survey may be prepared in lieu of a conventional plan of survey as stipulated in *Public Lands Administration Regulation (PLAR) Tables A1 and A2*.

Before carrying out a survey for a hybrid plan or a survey interacting with a hybrid plan, the Alberta Land Surveyor should be familiar with the following documents available through the Alberta Environment and Parks website:

- *Hybrid Cadastre Standards for Public Lands Disposition Surveys*
- *Public Lands Administration Regulation (PLAR) Tables A1 and A2*
- *Content Requirements for Survey Plans and Sketches*

13.1 Adjoining or Intersecting Existing Hybrid Cadastre Surveys

When a new survey adjoins or intersects an existing hybrid cadastre survey, sufficient observed coordinates shown on the existing hybrid plan shall be confirmed.

At minimum, a measurement shall be made on one observed coordinate point, and the difference between new and existing observed coordinates shall not exceed the absolute accuracy requirements outlined in the *Hybrid Cadastre Standards for Public Lands Disposition Surveys*.

13.2 Intersections

New boundaries shown on a hybrid cadastre survey must intersect all existing public lands disposition boundaries crossed that are monumented by statutory iron posts or establishment coordinates. Intersections should be marked with either statutory iron posts or establishment coordinates.

Section 14: Lot Grading Certificates

A Lot Grading Certificate is a document prepared for submission to an approving authority for review and decision-making purposes. It identifies the surveyed elevations of ground surface and built features within a property, and often illustrates the difference between existing and design grades.

When performing a survey for the preparation of a Lot Grading Certificate, an Alberta Land Surveyor shall ensure that:

1. Field notes follow the standards identified in Part C, Section 6 (Field Notes) on page 31.

2. Vertical accuracies meet the requirements identified in Part C, Section 1.7 (Lot Grading Certificates) on page 15.

3. An assumed elevation is not used when the approving authority requires geodetic elevations.

4. GNSS equipment is not used for portions of the survey adjacent to tall structures because of the risk of multi-path and scattered signals as explained in Part C, Section 2.1 (Sources of Error in GNSS Measurements) on page 16.

5. The approving authority's plan requirements are understood and addressed.

It is recommended that the Lot Grading Certificate plan include:

- a clear statement identifying what is being certified
- date(s) of survey
- date of certification
- notification that the Alberta Land Surveyor is not the approving authority and/or identification of the approving authority
- benchmark(s) from which the surveyed elevations were derived, and their elevations
- source of any design elevations shown, if available
- clear identification of the lands surveyed (i.e., legal description, municipal address, rural address)
- identification of the surface condition(s) surveyed (e.g., topsoil, sod, clay, concrete, etc.)
- when existing and design elevations are both shown, a clear indication of which are design elevations and which are existing elevations

PART E: APPENDICES

Section 1: ALS Certifications

Most plans should be signed by the Alberta Land Surveyor who is responsible for the plan.

This Section contains templates for two standard Alberta Land Surveyor certifications on plans that are not registrable at the Land Titles Office or the Métis Settlements Land Registry:

1. Alberta Land Surveyor's Real Property Report
2. ALS Certification for Wellsites on Private Land

Plans that are submitted for registration at the Land Titles Office or the Métis Settlements Land Registry also require various signatures, affidavits, statutory declarations and/or other approvals. The Surveyor should consult Service Alberta's Land Titles Procedures Manual or the Métis Settlements Land Registry Registrar's Rules regarding which of these are required for the type of plan being prepared and submitted for registration.

An Alberta Land Surveyor must prevent the unauthorized use of digital signature images and permit stamps by implementing appropriate policies and controls. The Surveyor should:

- ensure that the Surveyor's digital signature image is securely stored, and that strict controls are in place to prevent unauthorized access to that image;
- ensure that procedures are in place for verifying that the products on which the Surveyor's digital signature appears have been reviewed by the Surveyor and that the placement of the Surveyor's digital signature image on those products has been explicitly authorized by the Surveyor;
- ensure that digital signature images and permit stamps are removed from survey files before the files are released to clients; and
- ensure that the Surveyor's digital signature image is removed from a firm's digital files when the Surveyor is no longer employed at that firm.

ALBERTA LAND SURVEYOR'S REAL PROPERTY REPORT
[Firm Name and Address]

To: [Client Name and Address]

Re: [Legal Description, Address, Municipality] ("the Property")

Date of Survey: _____ Date of Title Search: _____
A copy of the title is attached.

Alberta Land Surveyor's Certification:

I hereby certify that this Report, which includes the attached plan and related survey, was prepared and performed under my personal supervision and in accordance with the Alberta Land Surveyors' Association's Manual of Standard Practice and supplements thereto. Accordingly, within those standards and as of the date of this Report, I am of the opinion that:

1. the plan illustrates the boundaries of the Property, the improvements as defined in Part D, Section 8.5 of the Alberta Land Surveyors' Association's Manual of Standard Practice, and registered easements and rights-of-way affecting the extent of the title to the Property;
2. the improvements are entirely within the boundaries of the Property [except _____ _____ (to be used if applicable)];
3. no visible encroachments exist on the Property from any improvements situated on an adjoining property [except _____ _____ (to be used if applicable)]; and
4. no visible encroachments exist on registered easements or rights-of-way affecting the extent of the Property [except _____ _____ (to be used if applicable)].

[Note relevant extraordinary circumstances here.]

Purpose of Report:

This Report and attached plan have been prepared for the benefit of the Property owner, subsequent owners, and any of their agents for the purpose(s) of _____ [a land conveyance, support of a subdivision application, a mortgage application, a submittal to the municipality for a compliance certificate; practitioner should identify the appropriate purpose(s)].

Copying is permitted only for the benefit of these parties, and only if the plan remains attached. Where applicable, registered easements and utility rights-of-way affecting the extent of the Property have been shown on the attached plan. Unless shown otherwise, property corner markers have not been placed during the survey for this Report.

The attached plan should not be used to establish boundaries (e.g., for fencing) because of the risk of misinterpretation or measurement error by the user.

The information shown on this Report reflects the status of this Property as of the date of survey only. Users are encouraged to have the Real Property Report updated for future requirements because subsequent development changes on the property will not be reflected on the Report.

Dated at _____, Alberta on _____ (month) _____ (day), 2_____.

_____

John L. Surveyor, ALS
(copyright reserved)

This document is not valid unless it bears the original signature or digital signature of an Alberta Land Surveyor and a (survey company) permit stamp [if applicable].

[*On the plan insert the following:*

This plan is page 2 of a Real Property Report and is invalid if it is detached from page 1.]

ALS CERTIFICATION FOR WELLSITES ON PRIVATE LAND

I, _____, Alberta Land Surveyor, of _____, Alberta, certify that the field survey represented by this plan is true and correct to the best of my knowledge, was carried out in accordance with the Alberta Land Surveyors' Association Manual of Standard Practice, and was performed between the _____ day of _____, 2_____ and the _____ day of _____, 2_____.

_____	_____	_____
Alberta Land Surveyor	Date Signed	Witness (name of witness)

Section 2: References

Alberta Land Surveyors and their personnel should be familiar with a large amount of other information that is not contained in the Manual of Standard Practice. Practitioners should always remain aware of ongoing events that may affect their profession and use the search feature on the ALSA website to find *ALS News* articles and other ALSA publications. The information appropriate to a given practice will vary to some extent with the type of practice.

The sections below provide abbreviated, alphabetical lists of references available on the ALSA website, the Queen's Printer website, and other websites.

2.1 ALSA Website

1. Acts, Regulations, and Manuals (current)
2. Alberta Land Surveyor's Commitment to Property Damage Mitigation:
    a) for Rural Property
    b) for Urban Property
3. Bulletin 38 (Department of the Interior), giving a Description of Boundary Monuments Erected on Surveys of Dominion Lands 1871-1917
4. Continuing Competency Review
5. Corner Recordation Index
6. Court Cases
7. Historical Acts, Regulations, and Other Documents
8. History of Re-Establishing from Road Plans (1942 *Surveys Act*)
9. Indian Reserves Surveys (historical)
10. *Land Surveyors Act* (historical)
11. *Manual of Good Practice* (historical, 1988 to 1995)
12. *Manual of Standard Practice* (historical, 1996 to current)
13. Practice Review Board (PRB) Interpretations
14. Strata and Condominium Surveys (ALSA Standards Committee)

2.2 Queen's Printer Website

1. *Boundary Surveys Act* (current)
2. *Land Surveyors Act* (current)
3. *Land Titles Act*
4. *Métis Settlements Land Registry Regulation*
5. *Surveys Act*

2.3 Other Websites

1. ALS Statutory Declaration for Public Land Dispositions
2. *Canada Lands Survey Manual: General Instructions for Surveys, e-Edition*
3. Disposition Plan Requirements
4. Energy Legislation, Rules, and Directives
5. Geo-Referencing Digital Plan Submissions
6. Geo-Referencing Digital Plan Submissions Frequently Asked Questions
7. Métis Settlements Land Registry Registrar's Rules
8. Oil and Gas Legislation, Rules, and Directives
9. Registered Public Land Disposition Plans
10. Standards, Specifications, and Guidelines for GPS Surveys of Alberta Survey Control
11. *Survey Manual – Public Land Surveys*
12. Survey Plan Online Checker (SPOC)

Section 3: Glossary

The terms defined in this glossary are used by Alberta Land Surveyors in their professional practices. Additional definitions are available in the *Surveys Act*, *Land Titles Act*, *Municipal Government Act*, and related legislation.

accuracy, absolute — the degree of conformity of a measured or calculated position to its true (actual) position. The absolute accuracy of any point is dependent upon the absolute accuracy of the known point(s) used to derive the coordinates and the relative accuracy of the connecting measurement to the known point(s).

accuracy, relative — The degree of conformity of a measured or calculated position of a point relative to other points.

azimuth — the azimuth of a point B from another point A is the angle formed by the vertical plane containing A and B with the plane of the astronomical meridian passing through A, such angle being determined from north, around through east, south, and west to 360°, east being 90°, south 180°, west 270°, and north 360° or 0°. Except in the case of a meridian or the equator, the azimuth of a straight line changes as the initial point moves along the line, and that direction is not defined by an azimuth unless the initial point is specified or implied.

bearing — the bearing of a point B from another point A is the angle formed by the vertical plane containing A and B with the plane of a fixed astronomical meridian, which may or may not be the astronomical meridian passing through A, such angle being reckoned like the azimuth from north around through east, south, and west to 360°. A straight line has the same bearing at all its points but, except in the case of a meridian or the equator, a direction is not defined by a bearing unless the meridian to which the bearing is referred is specified or implied.

bearing tree — a tree with a blaze approximately 1 metre above ground facing a monument.

boundary — a line, plane, or curved surface that defines the limit or extent of a parcel or an interest in land, a sub-surface region, or airspace.

calculated data — information derived by computation from sources that may not have been entirely measured by the Alberta Land Surveyor who displays the information.

digital signature	a digital representation of a practitioner's signature affixed to a digital document, or a digital signature accompanied by an electronic means of verifying the authenticity of both the digital signature and the digital document to which it has been affixed.
disturbed monument	a monument that has been moved by some means other than by an Alberta Land Surveyor during the course of a survey, and that can be proved beyond reasonable doubt to have been moved from its original position.
dormant plan	a plan that has not been registered within the required time period for a survey for which a registered plan is required.
lost monument	a monument, the position of which can be re-established only by its bearing and distance from some other monument or monuments to which it was previously connected by survey.
monument	as it relates to the *Surveys Act*, a statutory iron post, standard post, wooden post, mound, pit, trench, or anything else used by a Surveyor to mark a boundary, corner, or line [Section 1(p), *Surveys Act*].
obliterated monument	a monument that can be restored with confidence from traces of the original monument remaining on the ground or from other physical evidence of the position of the original monument.
parcel	a defined tract of land for which an interest or right may be granted and registered at the Land Titles Office, Alberta Environment and Parks, or the Métis Settlements Land Registry.
precision	the degree to which repeated measurements or calculations of the same quantity show the same or similar results.
public record	a record that includes a plan on record with the Land Titles Office, Métis Settlements Land Registry, Alberta Environment and Parks, Canada Lands Survey Records, or any other federal or provincial agency.
re-establish	to determine the position of a lost monument.
reference control marker	a mark, other than a monument or Alberta Survey Control Marker, that is set in the ground as a reference to the position of a boundary or other line not marked by monuments under Section 47 of the *Surveys Act* as part of a reference control network.
reference monument	a monument that is set in the ground at an offset location from a position that cannot be monumented as required under Section 45 of the *Surveys Act*.

reference point	a point identified on a plan of survey and referenced to a coordinate system—NAD83 (Original) or NAD83 (CSRS)—for a data set related to that plan. See also *Geo-Referencing Digital Plan Submissions* available from Alberta Environment and Parks.
registered record	a record that has been recorded, filed, or deposited as a public record with the Land Titles Office, Métis Settlements Land Registry, or Alberta Environment and Parks.
restoration survey	a survey made to restore the obliterated monuments of a previous survey.
resurvey	the survey of a previously surveyed boundary made to effect changes in, or corrections to, the previous survey or to re-establish lost monuments or to place additional monuments on the boundary. A resurvey always includes a retracement of the boundary and often includes the restoration of obliterated monuments.
retracement survey	a survey of the existing monumentation of a previously surveyed boundary in order to determine the bearings and distances between the monuments.
surface improvement on wellsite surveys	a railway, pipeline, canal or other right-of-way, road allowance, surveyed roadway, dwelling, industrial plant, aircraft runway or taxiway, building used for military purposes, permanent farm building, school, or church (the Alberta Energy Regulator's *Directive 056*).
surveyed boundary	the boundary defining the limits of a parcel that has been surveyed in accordance with the *Surveys Act* and is shown on a plan of public record.
surveyed line	any boundary shown as surveyed on a plan registered at the Land Titles Office or a blind line, whether surveyed on the original Township Plan or not, excepting thereout boundaries created by cancelled subdivision plans or abandoned Right-of-Way Plans as defined in Part D, Section 4.5 (Right-of-Way Surveys – Cancelled or Abandoned Plans) on page 47.
Surveyor	for the purposes of this Manual, an Alberta Land Surveyor as defined by the *Land Surveyors Act*.
theoretical section boundary	a line that would define the boundary of a section if the section were surveyed in accordance with Part 2 of the *Surveys Act*.
uncertainty	the range within which it is expected the error of measurement will fall.

Unsurveyed Territory	within the meaning of Part 2 of the *Surveys Act*, those lands that have not been surveyed and for which there is no official plan.
well	a well to be licensed and/or drilled for any purpose provided for in the *Oil and Gas Conservation Regulations* (Alberta Regulation 151/71) or the *Oil Sands Conservation Regulation* (Alberta Regulation 76/88).